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FIFTEENTH YEAR.

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IMPROVEMENTS IN BLAST FURNACES.

We design referring to that class of smelting or blast furnaces wherein retorts are placed at the upper part for the purpose of converting into coke and collecting and utilizing the gases given off from the coal being distilled in such retorts, whilst the principal end in view is the separation and collecting of the tarry and ammoniacal products. In the latest improvements effected, the retorts are arranged with sliding plates or doors, or their equivalent, one at the bottom of each retort and the other at the part where a prolonged passage from the retort meets the arch of the blast furnace at the top of the blast furnace proper, or the prolonged passage may be dispensed with, in which case the bottoms of the retorts are close upon the arch of the furnace. The purpose of this arrangement is to produce a more effectual sealing of the retorts and to prevent the gases from the furnace or air from gaining access into them. The retorts may be combined together in sets of two, three or more, discharging through a single opening in the blast furnace arch common to all of them, and be similarly connected at their upper ends so that a group of them may be charged as required from a hopper or bunker common to them. The retorts are heated by blast furnace gases burnt in flues surrounding them and the gaseous products resulting from the destructive distillation of the fuel in the said retorts are collected therefrom by being passed through a hydraulic main and then carried to condensers. To prevent the materials when charged through the central opening of a blast furnace from falling with too great weight upon the ordinary burden or charge of the furnace,there is suspended from the charging cone a second cone a short distance above the burden or charge. The materials, therefore, when charged through the ordinary cone in place of falling directly on the burden or charge, fall upon the second cone by which the force of the blow due to their fall is broken and they slide off gradually on to the top of the burden or charge. Another feature is the direct utilization of surplus blast furnace gases in retorts, stills, or equivalent apparatus, the object in this case being to effect the roasting or calcining of blackband and bituminous ironstones in close retorts, whereby the fumes arising from the usually practiced open-calcining in "bings" and the destructive influence of such fumes upon vegetation are thereby prevented, and so that the carbonaceous matter in the ironstone is converted into coke, whereby the fuel added to the charge within the blast furnace is diminished, also the tarry and ammoniacal products are collected. The retorts arranged round the top of the blast furnace proper, are provided at their lower ends with the sliding doors, which may be opened or closed by screws or by any other suitable means. These doors are also provided with means whereby a jet of steam or gas may be kept constantly blowing through and around their working surfaces, thereby preventing the passage of atmospheric air into the lower part of the retorts. When the covers of the chambers are raised, the retorts having been previously discharged, are recharged with fresh coal. The gaseous products given off by the charge while being coked pass through the chambers and thence through the pipes, each of which is fitted with a throttle-valve or regulator, and thence into the hydraulic mains from which it is led to the condensers. After the charge has been coked within the retorts, it is discharged from the same when the doors are opened and passes thence into the passages into the common chamber, which at the time of receiving the coked charge from the retorts is closed at the bottom part by the cone, which thus makes a comparatively tight joint against the passage of gases from the body of the blast furnace into the retorts. The heated coke is then mixed with a charge of ironstone and limestone which has been previously charged into the hopper by raising the cone,which allows the charge in the hopper to fall into the chamber and the mixed charge of coke, ironstone and limestone is then allowed to fall into the furnace proper by the cone being lowered, or instead of using the chamber as a charge-mixing chamber, the cones may, as is obvious, be so utilized as to allow the coked and non-coked material to fall into the blast furnace in separate or unmixed charges. In the modes we have indicated the greatest economy is secured and the best success attained in the separation and collection of the gaseous products.

LUBRICATING AND LUBRICANTS.

To lubricate economically, and at the same time efficiently, the jointed parts, valves, slides, steps, journals and gearings of any kind of machinery driven by steam is the aim of every thinking mechanic who superintends the operation. Good lubricants will prevent abrasion and carry away the heat generated by friction, and which would injure the machinery. They are ordinarily classed as oils and fatty matter, minerals and metallic compositions. The oils and fatty matter may be used separately, the mineral matter can only be applied as a lubricant in conjunction with the former, consequently are not true lubricants. The metallic compositions as applied in some instances act as an interposing cushion, and help to convey the frictional heat to the absorbing lubricant as much as the stream of water, sometimes applied, serves to carry away the heat which a heavy lubricant on a heavy journal absorbs more rapidly than it can give off. The liquid lubricants are the animal, vegetable, and mineral oils, the latter consisting principally of tallow or lard, or composition of both, with lime, sulphur, lead, asbestos, graphite, soapstone, etc. The former are principally used on machinery with slower motion and heavier weight. Good lubricants should possess the following characteristics: 1, Sufficient body to keep the surfaces effectually from abrading each other. 2, Greatest power for absorbing and giving off the frictional heat. 3, Least inclination to decompose by either atmospheric influence or temperature, or they should be clear and unctuous, free from acid, gum or grit, of low gravity, and should retain a uniform consistency at all temperatures. It is difficult to find lubricants that possess all these characteristics combined, and inferior ones are often prefered to better ones from want of knowledge about them among those who are in charge of their use. It is not unusual, for this reason, to see thick, heavy oils used where more limpid ones would be appropriate, and vice versa, or unsuccessful attempts made to force good lubricants to work through contrivances inadequate to the requirements of the case, or from false economy the endeavor to make lubricants of poor quality perform effective work where better ones would barely suffice. A little attention to, and more earnest investigation of this subject by manufacturers as well as employes, would do much towards the use of good lubricants only, and thereby save machinery and capital.

TEST OF THE NICKEL PLATE.

An excursion of the employes of the National Machinery Company of Cleveland, to Tiffin, Ohio, afforded this finely trained body of skilled mechanics the opportunity of inspecting the section of the Nickel Plate road between this city and Green Springs. They were accompanied by Mr. Henry Brunner the General Ticket Agent of the Nickel line. The late petulant depreciatory comments of Mr. Vanderbilt on the constructive work, made them more critical than they otherwise would have been, and gave zest to their comments on the solidity of the road-bed, and the massive character of the bridge ironwork and masonry. The smoothness of the new road-bed was a matter of surprise. The cars exceeded in comfort, lightness, and ease any previously traveled in by the party, and the paper wheels, which are of larger diameter than the ordinary iron wheels, and so cover a given space with fewer revolutions, glided so smoothly as to take away all idea of speed. One and all felt that a most important advance had been made in railway equipment, and that the New York, Chicago & St. Louis had fairly earned its novel *soubriquet*, which, besides having a metallic ring about it, conveys the idea of pre-eminence. It is vastly superior to the Lake Shore in construction and equipment. Arrived at Tiffin, the leading citizens of that enterprising city gave the employes a hearty welcome, entertaining them to dinner and supper. Mr. Brunner, who had accompanied the party to Tiffin, appeared to enjoy the proceedings as much as any of the men. The fine appearance of this body of mechanics was a subject of general and gratifying comment. The men, on their part, were equally pleased with Tiffin and its people, and without one exception announced a resolve to reside there. The works, which are rapidly progressing, were duly inspected in the course of the day.

EXPOSITION OF RAILWAY MACHINERY.

In this railway age, with 112,000 miles of railway in operation in the United States, it is full time that we should have an exhibition of railway machinery. Such an exhibition would prove of vast service to railway companies, as affording a full comparative test of the positive and relative merits of machines employed for railway purposes, and as freeing master mechanics in charge of railway machine shops from dependence on the representations of the agents of manufacturers. Such shops need to be equipped in the best manner, both on grounds of economy and excellence of workmanship, and no plan will meet this purpose but a general exhibition in which merit will rule. We are confident that the car builders and master mechanics of the country would welcome the carrying out of our proposal. In view of the pecuniary interests involved we are satisfied it would receive contributions from all manufacturers of railway machinery throughout the country, and that from the knowledge and experience brought to bear in judging the exhibits in each department it would mark a new epoch in general advance. Indeed, such an exhibition would assume a national importance. Its practical value would be simply incalcuable. Chicago, from its geographical position, with its radiating railway lines, occurs to us as the most desirable site. Little time being required for

preparation, we propose that it shall be held in the summer of 1883.

COPPER SUPPLY.

Comparatively but a short time will elapse before it will be out of the power of the principal Lake Superior copper mining companies to control the price of copper to the disadvantage of the manufacturers of articles into which that metal enters. It is evident that consumers here have been unduly taxed, their atock being sold in the English market at lower prices than obtained here. In no country has the manufacture of brass and brass goods been brought to such excellence as in the United States, and the expansion of this important branch of our manufactuaing industry has been retarded by the abnormally high cost ot the base of the mixture, copper. The remedy will come in the large supplies to be had from New Mexico and Arizona, and which have of late appreciably weakened Lake Superior copper. The requirements of this country are estimated at 30,000 tons per annum, but with an important reduction in the price of the article use can be found for double the amount. The scale on which copper is destined to be worked would promise to preclude any effective combination on the part of copper producers. The relief from a financial monopoly will be widely welcome.

WILL inventive genius ever bless the world with a gas meter that affords a perfectly reliable test of consumption? The inefficiency of those in use is a standing source of dissatisfaction to the users of gas. The weight or volume of nearly everything else can be obtained. The trouble is that gas must be measured while in movement. Mechanical and scientific effort would reap a rich reward in this line. The flow of the electric current can be accurately measured by Edison's invention, yet the less subtile gas defies as yet exact calculation. The gas companies are far from being enthusiastic on the point of improvement of meters, for they profit by the inefficiency of the instruments which increases the apparent consumption, and with this their charges. Every inventor of a gas meter is ready to take oath if necessary that his article is perfect, but nothing brought out as yet would seem to meet requirements.

THERE is no little comment in commercial circles over the slowness with which the grain product of the country is moving to the sea-board, as shown by the receipts of grain at the leading grain cities of the West. As a result, the imports of the country are running ahead of the exports, and many even profess to fear a serious scarcity of money by next spring, arising from the necessity of shipping from $25,000,000 to $50,000,000 of gold to Europe next summer to pay for our excess of purchases over our sales.

AT no time was there a larger consumption in this country of railway iron. A very considerable proportion of the increased demand arises from the necessity of heavier construction in rails and railway bridges, locomotives, wheels and axles. Renewal too, is proceeding at a rapid ratio, The new railways that are being built, and the railway extensions that are being carried out, demand an unprecedented supply.

AN English experimentalist remarks on the fact that spring and tool steel although flexible when cold, is repeatedly found to break when at the blue annealing heat. Steel thus breaking is found to be actually powdery at a temperature of 600 degrees and 700 degrees F., possessing little or no coherence; hence a large number of accidents, such as breaking of steel tires, shafts, etc.

MANUFACTURES.

TO MACHINISTS. MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own anguage, as all such contributions will be properly revised before sending to press.

OHIO INDUSTRIES.

CLEVELAND.

MR. GEO. FAULHABER, manufacturer of school and church furniture, also making a specialty of fine hard wood work, formerly carried on business in Ontario street, but owing to the increase of orders, moved last August into the more extensive structure corner Scranton and Jennings Avenues. We lately had the pleasure of being shown through his works, and were much struck by the artistic taste in design displayed in church furniture, such as pews and pulpits. The designs are such as to harmonize with the various styles of architecture, classic or composite. Those entrusted to him by architects are executed in a way that assures satis faction. The possibilities which with a thorough mastery of details, art may attain in the construction of school furniture, is illustrated in his stock. Mr. Faulhaber is second to no manufacturer in his line in putting choice woods to account for effective display, whilst the scale of his operations enables him to provide school, church, and choice articles of furniture at a minimum of cost. The workmanship is thorough, and he relies on it as much for sustaining his reputation as on design and finish.

WARNER & SWAZEY are making a specialty of brass-working machinery. They have recently received orders for general lines of this machinery from California. Their orders for this class of work extend from California to New England. They have doubled their working force within the past year, are constantly making large additions to their tools and machinery. Among the recent improvements introduced into their works is a system of automatic sprinklers, one of which is placed in every eight feet square of the ceiling. These are so adjusted that, when the temperature rises to 155 degrees, the sprinklers will automatically commence to work. Experimental tests show them to be a perfect safeguard against fire.

THE Cleveland Non-Conducting Co., No. 19 South Water street, manufacturers of asbestos, hair felting, cement and other pipe coverings, have lately furnished the Lake Shore Railroad Co.'s block, cor. ner Seneca and St. Clair streets. The contractors are well pleased with the job. This is the only firm in Cleveland which handles the above lines of goods. Their asbestos fibre is shipped to them direct from the mines.

MCDERMID & WILLIAMSON are fitting a shop with new tools, and have commenced to manufacture twist drills, reamers, etc.

BECKMAN & Co., manufacturers of shoddies, have their new dye house completed, and are producing 6,000 pounds of shoddies per day.

JAMES ATCHINSON is manufacturing and introducing a new machinist's turret lathe.

TOLEDO is fast growing into a manufacturing center, and capitalists are waking up to the fact of her railway and shipping facilities for distributing manufactured goods and for receiving coal direct from the mines. Six lines of railway now extend to the mines, and upwards of twenty lines radiate from Toledo as a center. The narrow gauge system is nearly completed from the south-west, which makes this the nearest lake port to the East from that section. The Merchants and Manufacturers Exchange report one and one-half million dollars capital organized for manufacturing purposes during the month of August, and among the companies then formed may be noted the Maumee Rolling Mills Co., capital $500,000; the Trumball Wagon Co., capital $300,000; the Bed Spring Manufacturing Co., capital $100,000; and the Bending and Handle Works, capital $50,000.

ALL the potteries of East Liverpool concerned in late differences with the men have been running either on short time or with diminished help, or not at all, and the output of ware has been entirely inadequate to the wants of the great territory generally supplied by this busy center of industry. It is earnestly to be hoped that some means of accommodating the existing differences may be devised, as trade once diverted from its normal channels is not easily regained, and the losses accruing to the men from their long idleness will be only aggravated and intensified by a continuance of the deadlock. It would seem that with a little concession on either side the difficulties are not so formidable but that they might readily be arranged, without wounding the pride or touching the sensibilities of any of the parties to the contest.—*Amer. Pottery and Glassware Rep.*

THE Union Manufacturing Co., Toledo, manufacturers of wooden ware, have this year added to their business the manufacture of the "Union" sewing machine, and have a new building, 200x40, three stories, with extensions 120x25 and 40x25, fitted complete with new tools, and having a capacity of fifty machines a day. The machinery outfit was purchased complete from the Pratt and Whitney Co., Hartford, Conn., at an expense of $50,000, and 125 men are employed in this department.

THE increase in the capital stock of Whitman & Barnes Manufacturing Co., of Akron, is rendered necessary by reason of large extensions and improvements at their several factories. They have built an entire new shop, fully equipped with new tools, at St. Catherine's, Ont., for handling their Canada business. They have made large extensions to their works at Syracuse, N. Y., and have doubled the capacity of their Akron and Canton shops.

THE Mahoning Iron Works, Youngstown, has a capacity of 75,000 tons of finished iron per annum, and they employ 1,500 hands. The principal product of these works comprises merchant bar, plate, sheet and hoop iron, nails, railroad and other spikes, and 12-pound T rails. They have 127 puddling furnaces. There is not a larger mill in the country. The annual pay roll is between $900,000 and $1,000,000.

THE blast furnaces at Haselton, a manufacturing suburb of Youngstown, give employment to 100 men, and their mill for sheet iron gives employment to 350 men. There is also a foundry and machine shop there that is at present making many castings for the car works. The same company own coal mines, which turn out 200 tons a day. The pay roll of the firm amounts to $30,000 a month.

THE capital stock of the Kelly Nail and Iron Co., of Ironton, to which we referred in our last issue, is nearly all subscribed, and active work will soon be begun on the plant. The latter will consist of a coke or stone-coal furnace and a nail mill to be erected in or near the vicinity of Ironton. Messrs. W. D. Kelly & Sons, of Ironton, are largely interested in the enterprise.

THE Canton Spring Co., manufacturers of carriage, wagon and seat springs, Canton, the proprietors of which are Messrs. D. Cobaugh and H. L. Kuhns, employ 90 hands. Trade at the present time is very good. They manufactuae their best springs from Swede steel. The company have lately made an addition to their works.

THE Sandusky Tool Co., Sandusky, has 210 hands in its employ. They write us that business is fully as good as last season. In addition to a trade with all parts of the Union they have a large European export trade. Mr. JI E. Marshall, is president; Mozart Gallup, treasurer, and F. M. Gallup, secretary.

THE Citizens Electric Co., Toledo, have organized and will supply Toledo with the Weston light. The upper portion of their new three story building, 110x40, will be rented for manufacturing purposes. Power for the building will be furnished by a plant of boilers and engines from Woodbury, Booth & Pryor, of Rochester.

THE Toledo Car Wheel and Foundry Co. have their new buildings completed, and with yards and railway sidings cover six acres of ground. The company was organized last year with $100,000 capital, and now have works with a capacity of 100 car wheels a day, besides a large amount of soft foundry work.

The Maumee Rolling Mill Co., of Toledo, has been organized, with H. S. Walbridge as president; Ignatius Droeg, general manager; H. S. Worthington, treasurer, and E. H. Van Hoesen, Secretary. Two-thirds of the stock of $500,000 is owned by the Licking Rolling Mill Co., of Covington, Ky.

Edward C. Post, Toledo, manufacturer of hydraulic and power elevators, shafting, pulleys, etc., has just added to his tools a new thirty foot lathe. He has just filled an order for 900 feet of shafting with hangers, and a 4,000 pound power elevator for the Western Automatic Screw Company, of Elyria.

The Toledo Spring Bed Manufacturing Co. have organized with $100,000 capital, and have new buildings completed, 80x40, four stories, with two additional floors, 100x50. They manufacture Bowen's spring bed bottoms and have a capacity of 200 a day.

Work has been commenced on the proposed improvements at the Buckeye Glass Works, Martin's Ferry. They propose to erect a 15-pot Gill gas furnace. The small one now in use will then be taken down and the material in it used in the construction of 5 or 6 lears.

The Champion Malleable Iron Co., Springfield, are turning out from 520 to 550 tons of first-class malleable iron per month, or somewhat over 6,000 tons per year. These figures are worthy of notice, being exceptionally high. The company employ 540 men.

The buildings of the new Elson Glass Co., at Martin's Ferry, are rapidly approaching completion, and it is hoped will be making glass in January. It is stated to be a model glass factory, especially in regard to light, convenience and size.

The Gill gas furnace of the Buckeye Glass Co., at Martin's Ferry, will be 21 feet 4 inches in diameter, and of the capacity of 14 pots. They have now in use two old-fashioned furnaces, one of which will be torn down.

The Niles Fire Brick Co., Niles, have completed their new works near the Thomas Furnace. They are makig a specialty of fire brick and blocks for iron, steel and glass works, out of the Thomas fire clay.

The roof of the casting house of Phœnix Furnace, owned by Brown, Bonnell & Co., at Youngstown, fell in on the night of October 17. No one was injured, and the furnace is running as usual.

The annual product of the Mahoning Valley Iron Co. is now about 4,000 tons of finished iron per month, making an aggregate of $1,700,000 per annum. The company employ 800 men.

James Means & Co., iron founders and machinists, Steubenville, employ 50 hands, and carry on an active business in rolling mill machinery and railroad castings. Jobbing is a specialty.

Beckman, Sr., & Co., of the Northern Ohio Blanket Mills, have their new addition 70x50, three stories, completed, and are manufacturing 200 plush lap robes a day.

The Jefferson Iron Works, of Steubenville, have contracted with the Wheeling Electric Light Co. for a 10-light machine on the Fuller system, for their mill.

The Dayton Lock Works, Dayton, which is organized with a capital of $80,000, for the manufacture of cabinet locks, will employ about sixty hands.

Wernet & Portmann, Massillon, manufacturers of stove, tin, copper, and sheet-iron ware, are doing an extensive business in roofing and spouting.

The ten starch manufacturers in conference at Cincinnati agreed to consolidate by forming a joint stock company with a capital of $2,000,000.

The cutlery company at Painesville ship shears, scissors, &c., to all parts of the United States and Canada at the rate of 60 dozen per day.

Booth, Miller & Co. are shipping several cars of machinery per week to New Philadelphia for the new rolling mill of Jas. Ward & Co.

The Lagonda Agricultural Shops, Springfield, have more orders for machines than they can fill, and are running extra time.

Buildings are being erected at Canton, for the pressed tin factory, to be removed from Wilmot.—*Amer. Manufacturer.*

Brown, Bonnell & Co., Youngstown, expect to have their new spike works in operation by the middle of next month.

The Hot Polished Shafting Works, Youngstown, have commenced operations with a fine plant of machinery.

The shops of John A. Thomas & Sons, Springfield, are crowded with orders for engines of all classes.

There is active demand for the product of the Ironton nail mills, and shipments keep pace with production.

Workmen are engaged at the Falcon Furnace, Youngstown, in changing the water hoist to steam hoist.

The Nail City Glass Co., at Bridgeport, will probably be ready to start up by December 1st.

All the rolling mills of Youngstown are on double turn, and thus making up for lost time.

The Hamilton Works, Youngstown, are filling large orders for rolling mill machinery.

A knitting machine company at Bucyrus ship $50,000 worth of goods monthly.

INDUSTRIES IN GENERAL.

MAINE.

There is now in process of erection in Skowhegan, says the *Mining and Industrial Journal*, one of the largest shoe factories in New England. It is 200 feet long and 60 feet wide, and will be four stories in height, of stone and brick. It will give employment to 400 or 500 operatives.

The new building in course of construction in Swanville for Cunningham & Saunders's carriage factory, is nearly finished. The building is 100x40 feet, and two and a half stories high.

Bath, which is the seat of wooden shipbuilding, is about to embark in iron shipbuilding.

MASSACHUSETTS.

The Sanford Whip Co.'s building at Westfield will be under cover by January 1.

The American Watch Co., at Waltham, are now producing 1,000 watches daily. This large production has never before been obtained.

The manufacture of cork goods is an East Boston industry. The bark of the cork tree is obtained from extensive forests in Spain, Portugal, the Spanish islands and the Pyrenees mountains. The cork is received in this country in bales weighing from 125 to 175 pounds each. After the cork is seamed it is taken by the cutters, who strip it with circular knives run by steam, and then from the slips are punched any desired shape or size with dies, also run by steam. The East Boston concern employs about thirty hands, and cuts up 1,500 pounds of cork daily.

Hill, Clark & Co., machinery dealers, Boston, were awarded at the Cincinnati Industrial Exhibition a gold medal, five silver medals and a diploma for the finest display of iron and woodworking machinery ever exhibited in the building. They sold every machine exhibited and duplicated a large number. They have recently received a large order for some special tools and machinery from a firm in Rangoon, Burmah.

The American Steam Gauge Co., 36 Chardon street, Boston, are running their works at full capacity, being very much driven with orders for the improved Thompson indicator, and they have also many orders for steam gauges from parties in the West, one order being for 1,000 brass gauges from a well known house.

NEW HAMPSHIRE.

H. W. Clapp & Co., of Concord, have this season built and put into operation a foundry with a capacity for forty workmen. The building is of brick, 132x52 feet and 20 feet clear posted. There are now three foundries in the city proper of Concord and one in Fisherville.

CONNECTICUT.

Dwight Slate, Hartford, has his enlarged shop full of work in process of completion. His sensitive drills and cutting off tools make a steady demand on his facilities.

The Brittin & Ellin Cutlery Co. are putting in silver solutions, as they propose silver plating part of their productions in steel handle knives, for which there is a large demand.

The C. Horton & Son Co., Windsor Locks, have built an addition to their manufactory to accommodate their increasing business in the manufacture of universal chucks.

The Naugatuck Rubber Works have stopped making shoes but continue glove making.

NEW YORK.

The Stephens Locomotive Co., of New York, capital $1,000,000 has just been incorporated at Albany.

The Tewksbury Automatic Elevator Co., 60 Temple Court, Beekman street, New York, have been awarded the contract to place two of their new elevators in R. H. White's new building in Boston, and one in the Boston *Advertiser's* new building on Washington street.

The Pulsometer Steam Pump Co., 83 John street, New York, write: The experiment of pumping boiling hot molasses with the new pulsometer was tried successfully last week by the Pulsometer Steam Pump Co., at the Manufacturer's Institute Fair, Boston. This pump, being set up especially for that purpose, handled the liquid with as much ease while at the temperature of 212 degrees F., as it would at 50 degrees. The manager of a large sugar estate in the island of Cuba, who was present at the test, was so pleased with the working, that he has since ordered one of them for his estate, and says that in his opinion it is the coming pump for sugar house use.

PENNSYLVANIA.

W. P. Buck, Harrisburgh, connected with the Pennsylvania and Maryland Development Co., is completing the arrangements of the organization of the Reading Copper Mining and Smelting Co. The project contemplates the building of a smelting works in that city for the extraction of pure copper from the ore.

William Swindell, Pittsburgh, is erecting two Siemens gas heating furnaces in the works of the Pittsburgh Forge and Iron Works. If they give satisfaction, it is said, all the furnaces in the mill will be changed to gas furnaces.

Adams & Co., glass manufacturers, Pittsburgh, have purchased land in West Elizabeth, twenty-two miles above Pittsburgh, to which place they intend to remove their works.

The Pittsburgh Steel Casting Co.'s new blooming mill is approaching completion. The building, of iron, is 102x200 feet, and was built by William B. Scaife & Sons. The engine is in position, and they are now waiting for the rolls.

INDIANA.

A stave concern at Terre Haute turns out a product of $500,000 a year. This includes 45,000 whiskey barrels and about 2,500,000 staves and a good deal of light cooperage.

The largest industrial interest in Terre Haute is the Car Manufacturing Co., whose transactions at present are enormous. The works, covering twenty-five acres, are under one roof, and are encircled by a belt railroad. They employ 500 hands, and are running at their full capacity of 300 cars per month and 120 wheels per day. The set-up shops are 120x300 feet.

ILLINOIS.

A new tile factory at Bloomington will, when completed, have the capacity to produce five miles of tile daily.

The new machinery for the Excelsior Iron Works, Chicago, is being placed, including a 20,000-pound lathe, 50 inches in diameter, and capable of swinging a shaft of ten tons. This is the strongest machine of its size ever brought to this city. Their new blacksmith shop is being supplied with a powerful trip hammer.—*Indust. World.*

Plans for the establishment of a watch factory at Bloomington are maturing. It is proposed to organize a company with a capital stock of $150,000.

The walls of the new smelting works in Chicago have been completed. The building now being erected is 245 feet long and 67 feet wide, and the walls, from the ground on the west side, 23 feet.

The Silver Star Steel Works have been organized in Chicago with $300,000 capital to make crucible and open-hearth steel. Mr. A. D. Lamb, of Brintnall, Lamb & Co., are among the incorporators.

THE M. C. Bullock Manufacturing Co., Chicago, will be in their new shops by December, where they will have increased facilities for the manufacture of rock drills and steam engines.

G. W. BROWN & Co., Galesburg, employ 300 men in their corn planter works, where they contemplate building a large number of machines. They have recently received an order from Odessa, Russia.

THE Chicago Rawhide Manufacturing Co., Chicago, are just moving into their new factory, 100x50, five stories, at 72 and 77 Ohio street. The new factory will employ 150 men, and have a capacity of 50,000 hides a year. They manufacture rawhide belting, lace and rope, and have just filled an order for 20,000 feet from Lowell, Mass.

WISCONSIN.

THE Marinette Iron Works are building a flywheel which will weigh nearly thirteen tons for the Ceder River Lumber Co.

MARSHFIELD, on the line of the Wisconsin Central now has an aggregate capital of $520,000 invested in its various manufacturing enterprises.

New stave factories are being erected in various parts of the State.

The vigor and enterprise of the western manufcturers may be inferred from the fact that E. P. Allis & Co., of the Reliance Works, in Milwaukee, turned out eight thousand tons of finished machinery castings during the year 1881. Among the latest products of this firm is the second pair of blowing engines recently completed for the Joliet (Ill.) Iron and Steel Co., having a capacity of 50,000 cubic feet of air per minute. The diameter of the air cylinder is 76 inches.

IOWA.

THE Comstock Stove Works, Burlington, shipped on an average 125 stoves per day last week.

THE Ottumwa Plow Co., organized with abundant capital, have erected extensive buildings into which they are now putting machinery, and will be turning out their improved cultivators within the next thirty days.

MICHIGAN.

THOMAS MURPHY, Detroit, manufacturer of smokeless furnace boiler setting, is doing $10,000 worth of work in Cincinnati.

THE Webster Manufacturing Co., of Detroit, employ from thirty to forty men and are manufacturing a variety of machinery, making a specialty of steam and wind engine.

THE Middlebrook Elevator Manufacturing Co., of Cetroit, will do a $35,000 business this year. They build all kinds of elevators and hoisting machinery and are building an average of five machines a month.

THE Buhl Iron Works, Detroit, are just finishing their work for the South Chicago Rolling Mills. Among this work was an order for a 6,000 horse power double compound steam engine, built to reverse at every seventh stroke. A novelty in their foundry consists of small air engines to operate their cranes.

THE Detroit Emery Wheel Co., Detroit, manufacturers of emery grinding machinery, have their new addition, 60 feet square, completed, and are placing their machinery in position.

MISSOURI.

THE Vulcan Iron Works, Cookson & Co., Kansas City, have just taken possession of their new works, and have added about $15,000 worth of machinery of the latest improved design.

THE rail mill department of the Kansas Rolling Mill Co., Rosedale, has commenced the manufacture of bar iron on the same train. The company expect to keep changing their machinery until the mill reaches its full capacity, 35,000 tons per annum of bar iron, fastenings, etc. The capacity of the spike mill has also been increased until it now has a capacity of 5,000 gross tons a year.

A NEEDLE manufactory has been established at Brooklyn, and is the only one in the country, all needles hitherto having come from Europe. They are to be made by machinery, which will be the first attempt of the kind. The manufacture has been entirely by hand and requires many operations; the conversion of the wire into rough needles requires twenty, the tempering and annealing nine, polishing five, which are repeated seven or eight times, and sorting five.

REVIEWS.

INDUSTRIAL HISTORY OF THE UNITED STATES. From the Earliest Settlements to the Present Time: Being a Complete Survey of American Industries; together with a Description of Canadian Industries. Copiously Illustrated with 300 Engravings by American Artists. By Albert S. Bolles, Lecturer of Political Economy in Boston University. Norwich, Conn.: The Henry Bill Publishing Co.

This work is a most complete and able survey of American industries, comprising agriculture and horticulture, the cultivation of our great national staples, the raising of horses and cattle, the various branches of manufacture, our shipping and fisheries, railroads, mines, mining and oil, and the various departments of commerce. In addition the labor movements and their results, with arrangements entered into by manufacturers are taken account of. The progress of financial organization is detailed, and a clear exhibit given of our present banking system. Insurance receives its due share of attention. In short, the work is in some sense a national encyclopœdia of the great activities of the day, and one may trace in it their several developments. The engravings which illustrate the numerous industries described are by the most eminent artists. The investigations of numerous previous writers in the several branches of industry dealt with, have been laid under tribute, and the result is a work which in every respect worthily represents this country. It is no marvel that two editions should already have been exhausted. In addition to its interest as a continuous narrative, it constitutes a standard work of reference. It is got up in a style of unchallangeable typographical excellence, and will make a handsome addition to any library.

LIPPINCOTT'S MAGAZINE for November. Philadelphia: J. B. Lippincott & Co.

The November number of this able illustrated monthly of popular literature, opens with a yachting article, "The Cruise of the Viking," which is finely illustrated. Other contents are: "Fairy Gold," a story; "Before Dawn," "Dom Pedro's Dominion," "Not as the Roman's Do," a story; "A Day With Emerson," "Quarterly Meeting in the West," "Some Authenticated Ghost-Stories," "Forest Worship," "Mark Bushman's Romance," "A Glimpse of the Seat of War," "After the Storm," "An Island Wedding," "Our Monthly Gossip," which is, as usual, highly entertaining, and "Literature of the Day."

THE COTTAGE HEARTH, for November. Boston: Cottage Hearth Company, 11 Bromfield street.

This charming household monthly has all that variety in its articles which lovers of entertaining and instructive reading could possibly require within the compass of a magazine. It is pre-eminently a magazine for youth, including young ladies, and is rich in pictorial illustrations. A valuable feature is the music department and another the fashions, which furnish plates of dresses and portions of dresses, that will give pleasing effects at a minimum of cost. There is a fancy work depatment. The articles are of a healthful and elevated tone, and the sketches embrace a wide range of interesting topics.

THE ART AMATEUR for November. New York: 23 Union Square.

The contents of this number should attract every lover of art. "Gallery and Studio" contains a number of choice views, and the ceramic department is richly illustrated. "Decoration of Furniture" deals, among other topics, with the art possibilities of stoves. Art needlework and art in dress have their usual attention. There is an able article on fret-saw work. The supplement to this number is particularly rich, containing designs for borders and medallions, monograms, embroidered screen panel (myrtles) and plaques, tiles, XVIth century Flemish Guipure lace and Egyptian and classic fret ornaments. Instructions are given as to treatment of these designs.

WIDE AWAKE for November. Boston: Houghton, Mifflin & Co.

The November number of "Wide Awake" provides a feast of entertainment for the young in its articles and spirited illustrations. There are two fine illustrated poems. "The Trojan War" and "Lost among Savages," are concluded, double instalments being given for that purpose. A comical story from France, the continuation of another, "A Suit of Homespun," with 14 illustrations, and "Another Ghost," are among its attractions. There is a romantic art paper relative to an American boy sculptor who is studying and working in France. A charming song is set to music. The reading course for young folks is continued.

A POPULAR GUIDE TO THE TERMS OF ART AND SCIENCE. By C. Bankes Brooks. Philadelphia: J. B. Lippincott & Co.

Exactitude in the use of scientific terms and phrases is of value to all classes of mechanics as well as to persons in general, and we can strongly recommend this work both for its fulness and precision and correctness in definition. The words are ranged under the specific subjects to which they relate, thus affording ready means of reference. In addition there is an alphabetical index at the close of all words defined, and which occupies sixty-four closely printed columns. A non-professional or non-scientific person having this work on hand will find it in a short time indispensable for reference, and of constant service.

FOREIGN CORRESPONDENCE.

ENGLAND.

BIRMINGHAM, October 21.

The iron trade continues in a satisfactory condition, and the tendency is towards higher prices all round. Coals and pig iron are both dearer, and as this increases the cost of manufacture, iron makers are not disposed to sell except at an advance. There is considerable unsettlement among the men, both in the coal and iron trades; it is quite certain that if the late improvement is maintained for a few months longer, there must be a general advance in wages, to be followed by higher prices. In some districts the demand for increased wages has been granted either in whole or part, others have refused to give any advance at all, whilst in other quarters the men have gone out on strike with a view to enforce their demands.

Pig iron has generally advanced in price. Scotch G.M.B. warrants fluctuated between 49s. 3d. and 52s., closing at 51s. 10s. According to returns made to the end of September, it has been ascertained that stocks in Scotland have been reduced over 100,000 tons since Christmas. The demand for some of the leading brands has been exceptionally active of late, and, as great difficulty is experienced in obtaining deliveries, it is believed that the stocks of some brands are pretty nearly exhausted. No. 3 Middlesbro' iron has been very firm from 44s. to 45s., closing at the best. The total stocks only amount to 269,273 tons, and as this is little more than equal to one month's production, iron might at any time become scarce. Notwithstanding this, the makers have decided to continue their policy of restriction another three months, so that it is quite manifest the producers in this district have the market almost under their entire control. Taking Scotland and Middlesbro' together, the stocks in these districts have been reduced about 270,000 tons during the past twelve months, the total now being about 1,100,000.

It appears that of 389 mills erected for tin plate manufacture, 21 are now engaged in rolling sheet iron, leaving 368 mills for tin plates, of these 52 are standing, as the result of the failures that have occurred. This leaves 316 mills at work, having an average weekly output of 21,000 boxes or an aggregate annual production of 6,636,000 boxes. The exports in 1881, were 4,500,000 boxes, and if the present rate of export is maintained up to the end of this year the total shipments for 1882 will reach 5,420,000 boxes, while the home consumption is estimated to be 1,100,000 boxes. From this it would appear that the present rate of consumption and exportation is about equal to the production. The stocks of tin plates in this country have decreased 150,000 boxes since the opening of the year.

At the Marine Exhibition, Tynemouth, the highest award—namely, a silver medal—has been awarded to the Steel Company of Scotland (Limited) for their steel castings. This company, who have made the production of steel castings a specialty at their Hallside Works, have succeeded in making castings for land and marine engines such as steel crank shafts, propeller and thrust shafts propeller blades, anchors, wheels of every kind, &c.

MECHANICAL RECEIPTS AND ITEMS.

Mechanical Engineering.

In mechanical constructions, machinists are everywhere giving up the use of that expensive and perishable material, wood, and the weak and brittle minerals, and are substituting for them iron and steel. Iron is slowly, but steadily and inevitably, being displaced by steel. During the past ten years steam pressure has risen from 50 to 75 pounds by gauge—and the consumption of fuel per hour and per horse-power has decreased from 2 to 1.8 pounds. Incidentally, the area of heating surface has decreased from 4½ to 4 square feet per indicated horse-power—that is to say, remaining, as formerly, nearly 2 square feet per pound of coal burned per horse-power per hour; where, as in some cases, pressures of 100 and 125 pounds are adopted, somewhat further gain may be expected. Increased pressure has been accompanied by increased speed of piston—from 300 to 500 per minute—and both causes have combined to reduce greatly the size and weight of engines. Formerly 500 pounds per indicated horse-power was a common figure; to-day one half that weight is often noted, and in special cases in which, as in torpedo boats, economy is not important, one-fifth, and even one-eighth those weights are said to have been reached. Surface condensation is almost exclusively adopted, but the area of cooling surface is becoming less and less, and at the pressure soon likely to become general, the production of a vacuum may possibly cease to be desirable, as it is already known to be with unjacketed cylinders; and the non-condensing engine may yet displace the condensing engine at sea as it has on land, and on our western rivers where this comparison was earlier made, and where the evil effects of cylinder condensation were earlier discovered.

Silvering Brass or Copper.

Silvering brass or copper may be effected by dipping the article in nitric acid to clean the surface, and then rubbing the surface with a composition of—cream of tartar 100, chloride of silver 10, corrosive sublimate 1. Then polish. Thermometer scales are thus silvered. Silver may be precipitated on to a surface in a lustrous form by adding oil of cassia or cloves or a solution of grape sugar to a solution of certain salts of silver. Mix aqua ammonia, 30 grains; nitrate of silver (crystal), 60 grains; spirits of wine, 90 grains; water, 90 grains. When the nitrate of silver is dissolved, filter, and add a solution of—grape sugar, 15 grains; spirits of wine, 1½ ounces, and water, 1½ ounces. Leave the articles in the solution for a day or two. In coating copper or brass vessels with tin, they are first pickled with sulphuric acid diluted with about three times its bulk of water, then scrubbed with sand and water and rubbed dry. They are next sprinkled with dry powdered sal ammoniac and slightly heated; a small quantity of melted block tin is poured into the vessel, which is turned about until the inside is well covered, the excess being poured back into the melting trough. Iron is treated in a similar way, but requires more care, having a less affinity for tin than copper.

Painting Iron Surfaces.

This subject is becoming of more importance as iron becomes more and more prevalent as a building material. Of the varieties of lacquers and paints used it is needless to write at length, as the all-important point is the actual state of the iron surface when the first coat is laid on. If that is not in proper condition, no subsequent application, however good in itself, has any chance of being permanently preservative, and that proper state is found when there has been formed upon the whole surface of the work a thin layer of the first or black oxide, which has been, while hot, thoroughly permeated by and incorporated with a resinous or tarry covering. Once formed, everything goes well. Additional coats of paint may be applied from time to time to renew the thickness of the original covering, but the iron underneath remains unattacked. If, on the contrary, a film of hydrate oxide (ordinary rust from exposure) be once allowed to form the successive coats of paint are thrown off sooner or later, and, in the meantime, the rust has spread under the paint.

To Blue Steel.

The mode employed in bluing steel is merely to subject it to heat. The dark blue is produced at a temperature of 600 degrees, the full blue at 500 degrees, and the blue at 550 degrees. The steel must be finely polished on its surface, and then exposed to a uniform degree of heat. Accordingly, there are three ways of coloring: first, by a flame producing no soot, as spirits of wine; secondly, by a hot plate of iron; and thirdly, by wood ashes. As a very regular degree of heat is necessary, wood ashes for fine work are to be preferred. The work must be covered over with them, and carefully watched; when the color is sufficiently heightened, the work is perfect.

ITEMS OF INTEREST.

LOUISVILLE has a foundry whose capacity is equal to 600 plows a day—one a minute.

IN Spain and Italy the vines are expected to yield a return variously estimated at from one-sixth to one-half above the usual average.

GLUCOSE seems to be an almost universal adulterant. It is used in honey, table sirups, beer, confectionery, and now they are selling it for glycerine.

THE South made no furniture worth mentioning for several years after the war. The output for 1882 is estimated by a shrewd observer at not less than $3,000,000 in value.

MEDITERRANEAN fishermen complain that their sea formerly free from sharks is now infested with them. The sharks come through the Suez Canal from the Red Sea and Indian ocean.

AT Dalton, Ga., a spoke and hub factory has turned out 1,200 spokes in a little over three hours in one day. As soon as all the machinery is placed in position it expects to turn out an average of 4,000 spokes per day.

SOME French chemists have succeeded in solidifying petroleum, in which state it burns like tallow. This solidification is effected by adding to distilled petroleum 25 per cent. of the purified juice of plants belonging to the family of the Euphorbiaceæ.

PRICES on future delivery for provisions are above what a satisfactory export trade can be effected at, and that values must come down to an export basis seems quite certain in view of the favorable prospects for heavy future supply of hogs and comparatively cheap feed.

THERE are now in this country fifteen Bessemer steel works, with thirty-seven converters that are capable of producing in the neighborhood of 2,000,000 tons of Bessemer steel annually, according to the capacity controverters are made to produce in the United States.

OVER 85,000 kegs of nails and spikes were exported last year. They went to over forty different countries, including England, Ireland and Scotland. Chili took the most, 1,806,500 pounds; Mexico next, 1,321,512 pounds; and Cuba third, 1,250,120 pounds. The British possessions in Africa took 581,987.—*Chicago Jour. of Commerce.*

PERHAPS one of the best methods ever introduced for tempering steel is that employed in hardening the blades of the famous Damascus swords. The furnace in which the blades are heated is provided with a horizontal slit through which a current of air from the outside is allowed to enter. This slit is placed on the north side of the furnace and has an exterior flat funnel-shaped attachment by which the wind is concentrated and conducted into it. The operation of tempering was, as a rule, performed only on those days of winter when a strong north wind prevailed, the red-hot blade being lifted out of the fire and gradually cooling in the current of air issuing from the slit. The proper degree of temper is thus often acquired by a single operation.

BY the union of gas and electricity Dr. Siemens believes that the steam engine will be doomed. For a time it may be used to drive large dynamo machines, which will take the place of numerous small steam engines, but ultimately the steam engine will be superseded by the gas engine. "Gas and electricity may be mutually hostile, but they are to unite their forces to extirpate the steam engine. The unpardonable sin of the steam engine is that of waste. Even the best of them consume two pounds of coal per horse power per hour; whereas, when the gas producer has taken the place of the complex and dangerous steam boiler it will not take one pound of coal to develop one horse power for one hour." As to the competition between gas and electricity Dr. Siemens believes that the latter will be used for lighting public places, but that gas will still be the "poor man's friend."

USEFUL RECEIPTS.

PEWTER.—The principal constituents of pewter are lead and tin; the proportions of the two metals depending somewhat on the use to which alloy is put. The best contains but 16 to 20 per cent. of lead. Of this plates and dishes are made, which look like block tin, and can be brightly polished by rubbing. The addition of more lead cheapens the commodity, and gives it a dull bluish appearance. In France pewter vessels for wine and vinegar contain 18 per cent. of lead. It has been found that a larger proportion of that metal in utensils for this purpose is liable to result in the formation, in the liquid, of the poisonous acetate or sugar of lead. A little copper added in making pewter hardens the compound and renders it sonorous, so that toy trumpets and other rude musical instruments can be made of it. If the copper is replaced by antimony, hardness and a silvery lustre are the result. If the contents of the melting pot are stirred with a strip half of zinc and half of tin, or if a lump of zinc is allowed to float on the melted metal during the casting, the vaporized spelter seems to protect the fluid mass from oxidation, and prevents the formation of dross. Hence it is said to "cleanse" the mass. Jewelers use polishers and laps of pewter, and sheets of the article are to some extent used for cheap engraving, music notes, or other figures being stamped upon it instead of being cut with a burin or graver. The ease with which it melts causes it to be employed by tinsmiths and tinkers for solder. Care must be taken not to set pewter dishes, mugs, spoons, lamps, etc., on stoves or other hot bodies, as, if left for any time, they are liable to settle into shapeless lumps.

PUTTY POWDER.—The most extensive use of putty powder is in glass and marble works, but the best kind serves admirably as plate powder, and for the general purposes of polishing. Putty powder for fine optical purposes is prepared by Mr. A. Ross by the following method, which is the result of many experiments. Metallic tin is dissolved in nitro-muriatic acid, and precipitated from the filtered solution by liquid ammonia, both fluids being largely diluted with water. The peroxide of tin is then washed in abundance of water, collected in a cloth filter, and squeezed as dry as possible in a piece of new clean linen; the mass is now subjected to pressure in a screw-press, or between lever boards, to make it as dry as possible. When the lump thus produced has been broken in pieces and dried in the air, it is finally levigated while dry on a plate of glass with an iron spatula, and afterwards exposed in a crucible to a low white heat.

TO BLEACH IVORY.—To give ivory a perfect bleach, it only requires exposure for three or four days in the sun; but it is necessary to leave the object, when immersed in turpentine contained in glass vessels, at some distance from the bottom on zinc or other supports, otherwise the white will not be perfect. Turpentine is a strong oxydiser, and to this property is due the bleaching. The same action is not only observed on bone or ivory, but also on wood. Turps, other essences and homologues of turpentine can be employed with the same results.

PATINA.—An imitation of patina for bronze objects of all kinds can be produced by preparing a paint of carbonate of copper and any light alcoholic varnish, and applying it to the object with a brush. This green color penetrates the smallest recesses, and has, when dry, the appearance of patina. Carbonate of copper gives a blue patina, verdigris a light green, and intermediate shades of color can be obtained by mixing the two.

INDESTRUCTIBLE INK.—An ink that cannot be erased with acids is obtained by the following recipe: To good gall ink add a strong solution of fine soluble Prussian blue in distilled water. This addition makes the ink, which was previously proof against alkalies, equally proof against acids, and forms a writing fluid which cannot be erased without destroying the paper. The ink writes greenish blue, but afterwards turns black.

THAT must have been a unique and beautiful sight, a few days since, off Sandy Hook, when, at the lifting of the dense fog which had prevailed for thirty-two hours twenty three ocean steamers took up again the homeward journey, interrupted so near its close, sailing up the harbor in stately succession—an argosy of commercial wealth, international peace and glad home coming.

PRACTICAL MECHANICS.

WROUGHT AND CAST METAL.

By Thomas F. Hagerty.

CONCLUDED.

Any mass of wrought iron must consist of two parts—the iron chemically combined with other elements, or a certain amount of cinder or slag, in layers or masses, which of necessity exists mechanically mixed in the iron, as the result of its mode of manufacture. Any large mass of wrought iron is further affected by welds, which must be formed in the production of the mass. The cinder or slag and the welds are such obvious elements of weakness, that the statement of their presence is sufficient to prove that the iron containing them cannot be in its highest condition of strength. Let such iron be thoroughly fused, however, and all of its component parts which have not been, or may not be, chemically combined with the iron, will either rise to the surface as scoria to be removed, or will become so completely dissolved in the molten mass as to cease to be elements of local weakness. There is every reason, therefore, why cast steel should be a stronger and more reliable material than wrought iron, and no reason why it should not be so. The correctness of this reasoning is borne out by the results obtained with the testing machine. The investigations of German, French, English and American engineers all point to the fact that in steel suitable for purposes of construction an ultimate tensile strength of 75,000 pounds, with an elastic limit of 42,000 pounds per square inch, may be safely counted upon, which is 50 per cent. in excess of the strength of the best wrought iron. Steel of this strength can always be produced so as to possess a degree of ductility and resilience equal to, and even in excess of, that of iron. The resistance to torsion and shearing in such steel is fully as much greater than that of iron, as its tensile strength is in excess thereof.

As concerns the conversion of cast lead into wrought lead, it is most advantageously and quickly performed in proportion as the lead is heated to approach the melting point, for in proportion to the heat the crystals are softened, so that the pressure upon them destroys their shape and character and the molecules of the metal are cemented together and brought into the peculiar fibrous structure inherent in wrought metal. This conversion of cast lead into wrought lead may be effected by forcing the metal cold through a die; but in so doing much greater pressure is required for the purpose, than if the metal be softened by heat. The process is facilitated, if we bring the solid cast metal nearly to the melting point, and force it through the die, in which place less pressure is required, inasmuch as the crystals yield to and are destroyed by a slighter application of force. If we desire to get along with the application of a still less degree of power applied to the metal, we can first melt the latter and then cool it just previous to its entrance to and its passage through the die. In this case the pressure is applied to the crystals, practically, as fast as they are formed and immediately after their formation, and inasmuch as they are in their softest condition at this initial stage, they are the more readily destroyed and the metal brought into a wrought condition, as they are forced under pressure through the die. The result of either of the just mentioned methods is the same, namely, a wrought product in which the crystalline and porous structure is destroyed, and a dense fibrous metal of totally different character in many respects is produced.

The differences between wrought lead and cast lead are so great from a practical standpoint, that I find very few cast traps now in the market. A few may be sold in New York City, but even as far from the place of manufacture as the Pacific Coast, the cast lead traps are seldom seen in plumbing establishments, and they are conceded to be virtually superseded by the wrought lead traps formed by forcing the lead through a die.

Any wrought metal can be melted by a proper degree of heat, and when melted and cooled will assume its crystaline state—in other words, will form a crystaline casting. This is the case with wrought iron as well as with wrought copper, wrought zinc, wrought lead and other wrought metals. And wrought copper, zinc, etc., are preferred by brass founders for making castings where purity of metal is required, inasmuch as the compression and drawing in the production of the wrought material mechanically eliminates foreign matters from the metal. As concerns iron, it is a common practice for manufacturers of sash weights to melt up the sheet iron of waste tin (which is the most thoroughly wrought variety of wrought iron) and other wrought iron scrap and cast it into weights. If the melted wrought iron were cast without admixture of pig iron, the castings would be too highly crystalline and brittle; to reduce this brittleness of the castings thus made from melted wrought iron some common pig iron is afterwards added.

INDUSTRIAL SCIENCE.

Single and Double Belting.

Single belts may be used, with economy, as wide as twelve inches, but where greater width is required they should be of double thickness. All belts, eight inches wide and more, are cut out of the hide lengthwise of the back. This is necessary, to insure their running straight. A wide belt made of leather cut from the side, cannot, with the greatest care, be made to run evenly, on account of the differences of the tensile strength of the different portions of the hide; but a wide belt, made from the center of the back, has the same thickness and quality of leather on each side, and must necessarily run evenly, the lightest and weakest parts of the leather being in the middle, and the strongest and heaviest on the sides, the difference in thickness amounting, in some cases, to as much as one-fourth of an inch; for this reason, when a wide, single belt is placed under a heavy strain, the thick, heavy edge crowds up towards the center, or lighter part, running on the crown of the pulley, and this prevents the even, uniform hug, so essential where the best results are desired.

Double belts are stiffer and better able to resist the tendency to cup in the middle, to crowd up from the edges, as they generally hug the pulley closely along the whole width. There are those who hold that the single belts, being more flexible, adhere better to the pulley, but this is correct only in cases where they are subjected to but a moderate strain. Where an inch single belt has to do heavy work, it will be almost certain to stretch, lift up from the pulley in the middle, or the fastenings give away, whether they be of lace, hooks or otherwise, therefore, where a single belt must be used, it should be of ample width for the labor to be performed, and not run too tight on the pulleys, so that the fastenings need not be strained. When the fastenings frequently give out it is a sure sign that too much work is being done by the belt, or a double belt, should be substituted. For machinery which is run at a high rate of speed, and where fine work is done, light even belts with joints only cemented should be used. Such joints will pass over the pulleys smoothly, causing no jar, or vibration, to either pulleys or shafting.

Double belting should always be used when a slow motion, greater strain and hard labor is required; also when a belt is to be run at one quarter turn, so as to give the proper angular motion, the principal strain in these cases being on the sides. Belts which have to be constantly shifted, or those which are run on upright shafts with flanged pulleys, should also be double. Where wide belts are made double they may be subjected to severe strain without injury, for there must always be one strong solid part to the leather to cover every point of possible weakness or where the ends are lapped in breaking joints. For common work, in both single and double belting, cemented and pegged belts are good. It should not be forgotten in ordering belts that one wide belt is better than two narrow ones, even if the two narrow belts would, together, cover more surface than the one width one. It is very poor engineering to drive a machine with two separate belts on one or two pairs of pulleys, when the pulleys are of exactly the same dimensions, which is seldom the case. The belts cannot be made so entirely even but what one will sometimes pull and the other slip, or one in some way be continually running faster than the other.

Structural Steel Tempering.

The rapid cooling of heated metal constitutes tempering, and the intensity of its effects increases as the difference in temperature between the metal and the cooling liquid becomes greater. The principal effect of this operation on steel is, generally speaking, an increase in the hardness of the metal, and by heating and cooling in different degrees and at different rates of rapidity we are not only enabled to obtain the extremes of hardness and softness, but also almost all the intermediate degrees between the extremes. The rapid contraction of the external layer brought about by cooling, while the inside is yet at a high temperature, produces pressure upon the internal layers, and reciprocally, in order to contain the greater volume of the still hot inside layer, the external layers must stretch at the expense of their elasticity. Hence we may, with perfect propriety, conceive of tempered steel as in a condition of continuous internal statical strain, resulting in extreme rigidity and brittleness, and therefore exhibiting the greatest amount of solidity as indicated by maximum hardness and tenacity. This molecular tension results in the "drawing out" or "forging," as it were, of the less rigid internal layers into accommodating dimensions by the pressure from the external layers. This is evinced by the decrease in specific gravity and increase in dimensions of hardened steel. Gmelin established that the difference between hardened cast steel and steel not hardened is about as 7.6578 and 7.9288. Dr. Percy ("Metallurgy of Iron and Steel") says: It has long been known that, by hardening, steel expands sensibly, and consequently decreases in specific gravity. Reaumur seems first to have recorded the results of accurate experiments on the subject. "M. Perrault,' he writes, "has always observed before us that a steel wire, after hardening, could not pass through the same hole as before hardening. I have repeated this experiment in different ways, and I have always found an increase of volume in hardened steel; but I wished further to ascertain the extent of this increase, and whether it was sufficient to admit of being determined by measurement.'" He did so, and found that in the process of hardening steel increased 1-48th of its volume. This is borne out by the experiments of M. Caron, who observed the following variations in steel bars:

Rolled bars.	Natural state.	After tempering.
Length	20.00	20.45
Width	1.51	1.51
Thickness	3.70	3.70
Volume	111.74	114.25

We see, therefore, that with steels tempered under the same conditions, strength and ductility follow the same law that obtains with non-tempered steels, viz., increase of strength and ductility are in inverse ratio. The table further shows, that in tempered high steels the elastic limit is reached under a very heavy load only, while with the softer steels this limit is much sooner attained. Annealing after tempering will more or less destroy the effects of the latter, and restore the steel to its natural condition.

RAILROADS.

THE last spike has been driven on the Columbia River Division of the Oregon Railway & Navigation Co.'s line, and there is now continuous rail communication between Portland, Oregon, and the heart of the Rocky mountain region at the end of the Northern Pacific track, a distance of about 500 miles.

THE Elevated Railways of New York, from October 1, 1879, to September 30, 1880, carried 60,831,756 passengers, with cash receipts of $4,612,975.56. From October 1, 1880, to September 30, 1881 they carried 75,585,778 passengers, $5,311,074.85 receipts. From October 1, 1881, to September 30, 1882, they carried 85,361,020 passengers with $6,97,733.41 receipts.

THE court of appeals at Albany, N. Y. has reversed the judgement of the lower courts and ordered a new trial to determine the question of damages in the case of Storey vs. New York Elevated Railroad Co. Storey claimed to own a part of the street in front of his property, and sued the road for damages on the theory that the corporation was guilty of trespass. The decision is that of a bare majority of the court.

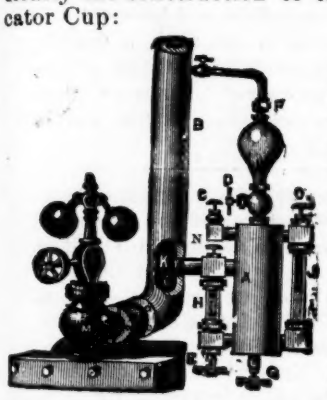
THE Cleveland, Youngstown & Pittsburgh Railway Co., has by purchase and consolidation acquired the rights and properties of the Alliance & Lake Erie Railroad and the Steubenville, Canton & Cleveland Railroad, with the latter's title to its 3,000 acres of coal lands, situated at Richmond in the vicinity of Salineville, thus giving the Cleveland, Youngstown & Pittsburgh Railway Co., a short line between Lake Erie and the Ohio River.

SIGHT FEED LUBRICATOR CUPS.

The first and all important point in keeping engines and machinery generally in good working order, is the proper lubrication of the wearing parts. The difficulties inventors have encountered have been securing (1) a continuous supply of oil to the parts to be lubricated and (2) some efficient method by which the quantity used should be regulated with exactness to the needs of the engine.

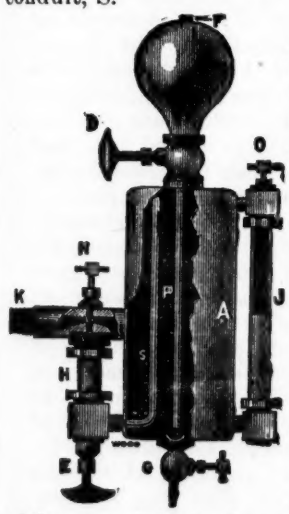
The Detroit Lubricator Company, Detroit, has succeeded in producing a method of lubrication which is not only free from the drawbacks incident to previous devices, but secures the most perfect and therefore the most economical lubrication, the invention including the blending of the oil with steam, which steam becomes its distributor, in a vaporized condition, to all parts reached. The cup is free from complicated parts and supplies just the film necessary between the wearing surfaces, continuously applying the regulated amount of oil, and affording also the means of watching the supply.

The following illustration will exhibit very clearly the construction of the Sight Feed Lubricator Cup:



A, oil reservoir; B, steam pipe; C, oil filler; D, water feed valve; E, valve to regulate flow of oil; F, steam tube and condensing chamber; G, valve to draw off water, to prevent freezing, etc.; H, visible feed water chamber; J, glass indicator; K, oil discharge pipe; M, governor valve; N, valve to correct pulsation or unsteadiness in feed; O, vent to be opened when filling cup.

We next present a sectional view exhibiting the position and action of the water pipe, P., and oil conduit, S.



The oil is introduced in successive drops into the steam by which, as we have stated, it is brought in contact with all wearing parts to which the steam has access. It needs no argument to show that vaporized, the oil must be far more efficient for lubrication than in its plain liquid condition, and that in its perfect action, thus combined and distributed, must minimise friction.

A glance at the indicator J affords a view of the quantity of oil contained, whilst the sight-feed—a special feature of the instrument—exhibits the rate at which oil is being supplied, a rate admiting of ready regulation.

The cups of the company are being used in large and small manufactories throughout the country, and the large facilities possessed by it for turning out supplies are being taxed to their utmost. The judgment of manufacturers and engineers who have the cup in use has been confirmed by the judges at the fairs of the American Institute, New York, 1880 and 1881, at the Millers International Exposition, Cincinnati, 1880, at the International Cotton Exposition, Atlanta, 1881, and at various other exhibits, these awarding for it the first premium. Its equal adaptation to stationary, marine, or locomotive engines, air-brakes, or steam pumps, is greatly in its favor. We may add that the cups are capacitated to hold from half a pint to one gallon. Those who are using the cups were surprised, in the first instance, by the little amount of oil needed for perfect lubrication. As was to have been anticipated in the case of such a valuable invention, the patent under which it is held by the Detroit Lubricator Company has been contested in the courts by parties holding patents for other oilers, but without the least success on the part of the contestants, the courts uniformly decreeing that the company had the exclusive ownership. Such is the confidence of the company in this cup, that they send it, when desired, to responsible parties for twenty days' trial, without making any charge. The works of the company are at Nos. 222, 224, 226 and 228 Congress st., West, and their offices at No. 98 Griswold st., Detroit, Mich.

SCIENCE AND INVENTION.

STOP MOTION FOR STEAM ENGINES.—George W. Briggs, Denver, Col., has invented the combination of a reciprocating rod, provided with a depression or notch, a sleeve or socket adapted to transmit the motion of such rod, and a cam pivoted to the sleeve and adapted to enter the depression in the rod through a hole in the sleeve for the purpose of locking the rod to the sleeve at a determinate point.

STEAM ENGINE GOVERNOR.—In this invention, patented by John E. Brown, Indianapolis, Ind., the balls, in a single piece, are pivoted diagonally across the shaft, an increase of motion tending to throw them at a right angle thereto, such movement of the balls being transferred by a system of links and levers to the valve stem. This force is counteracted by a spring.

ECCENTRIC FOR STEAM ENGINES.—John W. Thompson, Salem, Ohio, has invented the combination of an adjustable eccentric, and a balance or counterweight secured thereto in such position as to exert its gravity upon the eccentric in a reverse direction to the action of the steam pressure upon the stem of the valve actuated by said eccentric.

TRANSMISSION OF MOTION.—A patent recently granted in Vienna and Berlin uses bands of steel, tempered and hardened, to transmit motion from one pulley to the other, the faces of the pulleys being turned perfectly flat and then faced with a varnish of resin, shellac and asphalt. The fastenings of these belts are of a peculiar structure and cannot properly be described without engravings.

WARPING OF STOVE CENTERPIECES.—An improvement in the centerpiece of stove tops that prevents warping from heating, has been patented by Messrs. William P. Buell and John Wright, of Galliopolis, O. The piece is divided transversely at its middle in two parts, each of the parts having at their adjacent ends lugs that overlap each other, are pivoted together, forming a hinge in the center of the plate, so that they may rise from the pressure of expansion.

ALUMINIUM.—From the researches of Mr. W. H. Barlow it appears that aluminium possesses properties of a high mechanical value. A cubic inch of it weighs only .0972 pound, while its tensile strength is about twelve tons per square inch. It has, also, a large range of elasticity, the extension at the yielding point being two parts of its length. The modulus of elasticity is 10,000. Some samples two inches long gave a ductility of only 2.5 per cent.

COPPER-PLATING SHEET IRON.—A firm at Geisslingen, Germany, is said to be using a novel method for copper-plating sheet iron. The sheets are thoroughly cleaned and pickled, and sheet-copper similarly treated is laid on top of them, the edges of the latter being folded over the edges of the former with care, and chalk being plastered under the copper turned over to prevent it from welding. The sheets are then put into a muffle and heated nearly to a white temperature. They are passed through rolls three or four times, thus welding them together.

VALVE FOR STEAM ENGINES.—Elmer A. Sperry, Cortlandt, N. Y., has patented a valve which is thus described: The combination of a cylindrical valve seat having a series of ports arranged around the periphery thereof and communicating with the end of the cylinder of the engine and a slide valve, consisting of a cylindrical piston having radial steam channels, being so proportioned and spaced that by a partial rotation of the valve the solid portions between the channels of said valve are capable of closing and opening to the fullest extent the ports of the seat.

NOVEL KNIFE.—A knife for cutting and handling lard, butter, tallow, and like substances has been patented. The blade is of uniform thickness, having parallel edges, beveled equally upon both sides of its entire length. By this device, the cutting edges are formed midway between the upper and lower parallel sides of the blade. It is further provided with a bent shank, adapted to permit the blade to pass close to the sides of the vessel in which the substance is placed, and to secure additional leverage in detaching the substance.

SMOKE-CONSUMING ENGINE.—The smoke-consuming engine invented by Mr. David Sinton, of Cincinnati, Ohio, is said to be a complete success. The peculiarity of the invention consists in a series of four arches of varying heights, built of firebricks and rising from the sides of the furnace to the bottom of the boiler. Between the third and fourth arches is a large open heat chamber. The coal is retained in the fire-bed, in front of the three arches, until the oxygen and coal gases combine and pass under the arches all aflame into the heat chamber, where they produce an intense heat devoid of any smoke.

STEAM ENGINE RECORDER.—A novel improvement provides a rotary paper carrier, with mechanism for moving it, and a marker with means for imparting to such marker in a given period upward movements corresponding in number to that of the strokes of a steam engine piston during such period, in order that marks indicative of the number of the strokes may be made by the marker on a sheet of paper moved as described. The paper carrier is capable of being used for varying pressure of the steam during a stroke of a steam engine piston and for registering the speed of the engine or number of strokes of its piston in a given time.

A NEW ELEVATOR.—A new elevator has just been patented which is likely to prove the first of a series of similar ones, as it presents certain elements of safety which are wanting in those of the ordinary kind. The essential peculiarity of the new elevator is that the car or platform carries its hoisting machinery with it, in the shape of a small electric motor placed on top of the car, and arranged to drive two vertical endless screws at the diagonal corners of the platform, which are geared into ratchets, or rather sections of corresponding hollow screws, secured to the posts which form the guides. The current is conveyed to the motor by a flexible insulated wire, which coils and uncoils on the top of the car as it ascends or descends. The great advantage which a screw elevator presents over all other kinds lies in the impossibility of its becoming detached from its supports. Even the breaking of several teeth of the ratchet will not release the screw, and nothing short of the complete disconnection of this from the frame of the car will allow the load to descend.

UTILIZING INDIA RUBBER WASTE.—A new method of disintegrating rock has been employed with considerable success by an Austrian engineer. The chief feature of the system is to employ a hollow cylinder-like tube, in which is placed a dynamite cartridge. The cartridge only touches the surface of the rock which it is desired to shatter. The explosion of the dynamite is effected by means of electricity, and the effect is said to be greater than the usual cartridge in a hole in the rock. The rock is shattered into fragments so small that a fair stream is able to wash them away without help, whereas in the case of gunpowder the rock is only split up into blocks more or less troublesome to remove. This system is calculated to effect a saving of fully 40 per cent. as compared with the old system.

THE N. Y. P. & O. Co., have purchased the road running from Youngstown to the Leadville shaft, and will soon extend it to Cornersburg to tap the new coal fields there. It will then be built through to Canfield to intersect the N. & N. L. road.

There are in service 769 railway post offices running over 87,865 miles of railway, making 76,741,438 miles of annual service, and employing 3,122 railway postal clerks and 448 local clerks, or 3,570 in all.

THE rail mill department of the Kansas Rolling Mill Co., Rosedale, have commenced the manufacture of bar iron, fastenings, etc. The capacity of the works is 35,000 tons per annum.

THE Southern Pacific route to San Francisco from New Orleans will be in active operation by Nov. 10.

ST. LOUIS is to be supplied with water gas for fuel purposes. The laying of pipes is progressing rapidly.

THE C. A. & C. RAILROAD.

What the State Inspector has to say of its Condition and Management.

Lieutenant Ruhlen, of the State University, one of the gentlemen appointed by the State Commisioner of railways to inspect the roads of the State, has just filed his report on the Cleveland, Akron & Columbus. He says, among other things, no road in the State that came under his observation shows such marked improvements as does this. Extensive improvements of a permanent character have been made, in addition to work done on structnres to make them secure. These are all of a high standard of strength and superior in design and manner of construction to those made a few years ago, recognizing in advance the continually increasing weight of engines and freight loads. The roadbed is solid, well linked and substantial. Ditches have received good attention. Fences are being constructed and repaired. Ballasting with gravel is going on. The most marked improvement is in the condition of the roadbed as regards smoothness, due to the fact that about twenty per cent. of all the ties have been renewed, and the worst of the old track taken up and replaced with 56 pound steel rail with angle bar joints. Three thousand tons of this have already been laid, and more is ready to be put down. All the bridges referred to last year as needing attention have been replaced with new ones of wood or iron. Several of the trestles reported on last year have been filled up and all others strengthened. Of the trestles in the road, about 3,000 lineal feet have been filled with earth, and this work is still going on. An overflow which occurred in August washed out several bridges between Holmesville and Fredericksburg, and seriously damaged large sections of the track. These damages, which are now being repaired, checked for a time the work of laying the track and other portions of the road. The recapitulation shows that since July, 1881, but in fact mostly since January, 1882, there have been built and placed in position eighteen spans of new truss wooden bridges and ten spans of iron plate girders, and that arrangements are perfected for adding fire plate girders; that three thousand lineal feet of trestle have been filled, and that all the others have been overhauled and strengthened. The report says the management is fully alive to all the requirements of the road and exactly what needed to make it a good standard road for freight and passenger traffic, and has pushed the work with such vigor that the results are surprising. The want of adequate terminal facilities in Columbus, and of side, switching and passing tracks on the road at nearly every important station is now being felt. This is of itself evidence of increased confidence in the road on the part of those who have business with it.

Schools to Train Mechanics.

The technological schools of Russia receive most liberal support from the government, and are managed very much like military schools, only that the pupils learn to become civil or mechanical engineers, or skilled workmen and foremen in construction shops. Russia has also technical schools and workshops less ambitious than those at St. Petersburg, where pupils may pay nominal fees for instruction, about $15 per annum for those who do not board at the institutions. The pupils attend school for four and a half hours per day, and work five hours. All of these schools are well equipped with machinery, the instruction appears to be thorough, and graduates find no difficulty in obtaining situations as foremen of other workshops. In the Russian method the shop is so arranged as to subserve the purpose of a well selected series of manual exercises, by which the hand of the pupil is trained in the movements required in practical mechanics. He is not constantly hampered by fear of wasting materials, nor is he called to account in that respect. One of the immediate advantages of this method is that it admits of a gradual marking in the same manner as proficiency in Latin or Greek, or any other school exercise. The French schools, like those of Worcester, Mass., manufacture articles for sale, and those of Switzerland are devoted, almost exclusively, to watch-making. Austria has eighty schools for industrial training, with about 4,000 pupils, but no information is given as to how they are managed. In some of these schools instruction is given at night, the pupils being employed at other work during the day. This is the nearest approach in any of the foreign schools to the experiment in industrial training now being tried by the Spring Garden Institute of Philadelphia. For two years instruction has been given in filing to classes, with such good results that this year a complete machine shop, on a small scale, is to be opened, and instruction to a larger class of pupils in every branch, except casting, of mechanical work in metals, and possibly in wood. It is not supposed that such schools can take the place of the workshop for training mechanics, but that, under present conditions of doing work mainly by machine tools, the apprentice attending the school can more readily acquire skill in the handling of tools and a broad general knowledge of mechanical operations.

Electricity in Ploughing.

A most interesting application of electricity to motive power is seen in the plowing machines of the late M. Menier, exhibited by M. Felix, which do the work of about 18 horses. In these are employed a pair of the large form of the Gramme machines, which were first made for them, but which have since become the usual form for Gramme motors. The ring armature has four poles, opposite which are the poles of the fixed magnets, each fed by two arms, giving somewhat the appearance of a square with all four sides prolonged each way, and inclosing a circle. All the eight arms are connected by an octagonal framework of a very solid form, forming part of the field magnets. This is undoubtedly the most compact form of Gramme machine which has been made. This machine is at one end of the electrical locomotive; at the other end is the gear for directing the motion of the whole engine forward or backward in the field to be plowed, or for stopping it and putting in action the machinery for winding up the large coil of wire rope, which coil is in the middle of the engine. The wheels are of course wide, like those of a traction engine, so as to pass over plowed land. One of these engines being stationed at each end of the field, with a triple-shared reversible plow between them, the electric contact is made, the Gramme machine turns round and winds up the wire, and so draws the plowshare along. When the plow has reached the end of a furrow the engines advance a step by gearing the Gramme machines to the proper wheels, the plow is tilted so as to bring three other shares into action, and the engine at the other end of the field pulls it the reverse way.

Protecting Iron From Corrosion.

A recent invention of Mr. Lyte, of Putney England, consists in an application of electricity for preventing the corrosion and consequent fouling of iron or steel ships, vessels or structures, by attaching to them suitably arranged conductors in such a manner that the said ship, vessel or structure when immersed in, or wetted by an electrolytic solution, sea water for example, shall become a cathode. The protective influence of studs or masses of zinc, or other metal electro-positive to iron, attached to iron plates immersed in water or certain saline solutions has already been tried and proved, but for certain reasons this arrangement has been hitherto neglected as being difficult of application, costly, and imperfect in its action. Utilizing, however the, modern discoveries in dynamo electriicty, Mr. Lyte proposes so to arrange one or more wires or conductors connected with the negative poles of one or more more batteries or dynamo-electric machines, as to convey the currents to the parts to be protected, or to distribute the effect as evenly as may be convenient over the whole or part of the ship, vessel or structure to be protected, the anode being at the same time immersed in or connected with the electrolytic solution. By this means he sets up a deoxidizing or reducing action all over the surface of the iron or steel to be protected, thus either arresting or materially diminishing the oxidation to which iron and steel are naturally prone, and he obtains thereby as a result the desired preservative effect.

Tires of Mixed Metals.

The Saint Chamond Works, France, have recently begun to manufacture tires of mixed metal—half iron and steel—and which, it is claimed, will have the hardness of the latter without its fragility. The body of the tire is composed of a ring made of pieces of puddled steel, and inserted between two hoops of fine iron, which form the outer sides of the section. The whole is welded together by the hammer. The principles of this manufacture are as follows, but they have not been developed very far as yet: A bar of fine iron, which is to serve as the core, is first rolled, and then a hoop of fine iron is put on each end cold. One of these hoops is afterwards to form the flange, and is composed of three coils of equal size. The other is formed of a single coil, and is to make the outer face of the tire. Wedges of puddled steel are then placed obliquely in the space between the two hoops thus making so many spirals inclined on the axis of the tire. This arrangement brings the wedges together when the hammer is applied and thus a complete welding is obtained. The wedges are cut from rolled bars; they should be of hard steel, but yet soft enough to weld easily with fine iron. The round pieces thus obtained are forged and welded with the hammer. Four heats are requisite to obtain a ring like those used in the ordinary processes. The welding is completed by the rolling, and it brings the inside core to such a small thickness that it disappears altogether in boring.

Cleveland Coal Trade

Cleveland handles upwards of one and a half million tons of coal per annum. The extension of railway lines, in in the coal regions, and the more abundant capital invested in coal mining are all in her favor. Other ports on the lake are securing a portion of the coal shipping trade, due to railway facilities and improvement of harbors, but there is no reason to think that she will not continue to receive the lion's share. The great coal deposit of the Hocking Valley and its tributaries has obtained great notoriety on account of its unusual thickness and its demonstrated fitness for iron smelting. The iron ores and limestones associated with it have designated that territory as a great iron working center of the future, and capitalists have already put many smelting furnaces in that region, the most of which have proved successful. But it is found that the black band and Lake Superior ores are required to mix with the native ores. Northeastern Ohio has now a direct line of communica- with the Great Vein territory, and is reaping great advantage from the industries there developed. But there are other parts of our mineral territory in the line of the direct highways to the Great Vein field of equal importance to us, and which will supplement in a remarkable manner the minerals of that field. Among other coals, those of Coshocton Valley are coming to the front.

INFANCY OF TRADE.—In that primitive story of the first commercial transactions in the early world's history, we have an artless way of relating the well known law that luxuries are parted with to supply necessities. But for this unequal distribution on the earth's surface of luxuries and necessities, even barter, which is the root of all trade, could not even have had a beginning. The infancy of trade may be seen in the system of barter as practised in Egypt and Arabia. Providence has so ordered it that gold and precious stones, the rich things of Arabia, are first found in their barren desert and washed down by the mountain streams. Egypt, on the other hand, the gift of the Nile, brings forth corn in abundance, which is readily bartered for the gold and spices of Arabia. The germ of all trade lay in this bartering of commodities, and the more it is freed from shackles the more it flows in these natural channels, the produce of one country being exchanged for that of others and in this way society took its first rise in the race of progress.

THE MARKET FOR CHEMICALS.—Judging the position of the chemical market we have to report a steadily improving tone, though it is not immediately felt on all articles, but, of course, this could not be expected unless there was a general all-around improvement. Nevertheless, there is a sufficient interest exercised by consumers, as shown by the number and variety of their inquries, to prove that they are closely watching the progress of events and following the markets in all their movements. The adverse influence of the dearness of money is counteracted by the restoration of peace in the East, which is already engendering the confidence of the commercial world that an increased trade may be looked for, and it is basing its actions accordingly. While it is too early yet to expect an actual increase in trade the prospects are deemed favorable to speculations, and sales on this account have been made during the week somewhat freely. Possibly this condition of matters may rule until the rush of the autumn export trade is over, when some reaction may be expected. The improved state of matters, however, for prompt delivery does not carry much benefit to transactions for next year's delivery. It is very difficult to obtain anything like adequate advances, or, in fact, any at all, unless the utmost firmness is shown towards contracting purchasers. Caustic sodas continue rather weak—cream particularly so, the demand being very quiet. Ash is still firm, and enjoys a good enquiry. Bleaching powder rather improves, and supplies continue below the requirements. Soda crystals are fully maintained. Sulphate of copper is again dearer. Acids show more disposition to improve. Potashes are a shade stronger. Arsenic remains scarce and dear.

MARKETS.

OFFICE OF TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, November 3.

FINANCIAL.

The borrowing demand has been somewhat light. Money is easier, the rate of discount ruling at 7@8 per cent. Call loans are negotiated at 5 per cent., and four to five months paper at 6 per cent. The market for Eastern Exchange is easy, but the mercantile demand light. Foreign exchange is firm and fairly active. Local securities are quiet as usual, but are in general held with the usual firmness, and not offered to any extent.

NEW YORK.—The stock market has been moderately active with prices variable and irregular, without, however, any important fluctuations. The weakest stocks embraced Western Union,

and New York, Chicago & St. Louis common and preferred.

IRON.

In respect to pig iron demand and supply are very evenly balanced, and demand has remained much the same as heretofore. Standard brands of Foundry iron are firmly held, with but little surplus stock offering or obtainable, the output being closely absorbed by contract deliveries, but brands less favorably known are obtainable at comparatively easier prices. There have been moderate arrivals of Scotch pig and a moderately fair demand. We quote: Eglinton, $23.25@23 50; Glengarnock, $25@25.50; Carnbroe, $25; and Gartsherrie, $25.50@26. Consumers do not, as in former years, show any particular anxiety to anticipate wants far ahead, and seem inclined to pursue a hand-to-mouth policy. As yet, this has had no effect upon prices, which remain the same as last week, namely, $14@16, according to size of lot and time of delivery. Old rails are quotable at $29 to $30 per gross for Tees and $32.50 to 23 for double heads. Makers of steel rails report inquiry still fair and the quotations strong at $44@46. Steel Blooms are dull at $35@36 Little is doing in scrap. Structural Iron is strong and steady, and manufacturers state that the outlook for the winter is as encouraging as at any time for several weeks past. Angles 2c.; Beams, 4c. Plate and Tank continue quiet and with a downward tendency, because of the falling off of the urgent demand which prevailed during the summer. Tank can be shaded at 3c.; Shell 4c.; Flange, 5c. Wrought pipes and tubes are firm.

CINCINNATI.—Reported by Rogers, Brown & Co. After a gradual decline in prices lasting through six weeks, a buying movement has begun which promises to bring about a reaction in the direction of better prices. A considerable number of large buyers have entered the market in the past few days, and contracts have been closed for some large amounts running through the whole of next year. Other considerable offers are pending and still further inquiries for round lots are before the Cincinnati commission houses. This business is directed almost wholly to Southern and Virginia Coke irons, which have become the controlling factor in Western markets. Makers are looking now for a steady range of prices for the remainder of the year, with the tendency slightly upward. The following cash quotations fairly reflect the market at the close of the week: Hot Blast Foundry.—Hanging Rock, C. C., No. 1, $26.50 @ $27.00; Hanging Rock, C.C., No. 2, $24.50@$25.50; Southern No. 1, $24.50@$25.50; Strong Coke No. 1, $23 00@$24:00; Strong Coke No. 2, $22 00@$23.00; Strong Coke No. 3, $21.00@$22.00; Soft Stone Coal No. 1, $22.50@23.00; Soft Stone Coal No. 2, $21.00@$22.00; Forge—Strong Neutral No. 1 Mill, $21 00@$21.50; Cold Short No. 1 Mill, $20.00@$21.00. Car Wheel and Malleable—Hanging Rock C. B., $31@$33; Hanging Rock W. B., $25@$27; Southern Car Wheel Iron, $31@$33; Lake Superior Car Wheel Iron, $28@$30; Lake Superior Malleable, $28@30.

CINCINNATI—Reported by E. L. Harper & Co. There is no marked change in the market worthy of note. Business continues moderate, and though prices are not strong the necessary demands of consumers will probably keep pace with the supply, in good Foundry and Mill grades. We quote as follows for four months: Foundry.—Hanging Rock Charcoal, No. 1, $26.50 @ 27.00; Strong Neutral Coke, No. 1, $23.00@24 00; American Scotch, No. 1, $21.50@22.50. Grey Forge.—Neutral Coke, $22.00@22.50; Cold Short, $20@21.00 Car Wheel and Malleable—Hanging Rock, C.B., $33.00@35.00; Hanging Rock, Warm Blast, $27@29 Lake Superior 1 to 2 $29@30; Lake Superior, 3 to 6, $30@32; Southern Car Wheel, $33@35.

COPPER.

The market for Ingot Copper is characterized by weakness and transactions have been on a limited scale. Lake in small lots has changed hands at 18⅛@18¼c., and Baltimore, with more frequent sales of rounder parcels, is held at 17⅞@17⅝c. London has fallen off a little, Chili Bars being quoted to-day by cable £70 10s. We quote: Bottoms, 31c@32c; Braziers, 30c@36c; Circles, 33c@36c; Sheathing, 28c., and Bolt Copper, 30c; Segment Sheets, 33c.; Firebox ditto., 30c.

LEAD.

The market is weaker, and owing to the large amount of production a further fall is anticipated. Sellers have offered Common Pig at 5 cents in round lots, while in a jobbing way dealers have asked 5.05. At St. Louis the market remains about the same, if anything a shade firmer. There is some better feeling due to better inquiry. We quote Soft Missouri 4.62½@4.65c., and Hard nominally 4.60c.

TIN AND TIN PLATES.

A continued decline in tin in London has caused more weakness here. Late high prices have stimulated productions. We quote for spot: 23½c. for Straits, 23¾@23¼c. for Australian, and 23⅞c. for Lamb and Flag. London cables £101 10s. In tin plates there has been a moderate business. We quote for large lots: Charcoal Bright, $6.12½@6.37½; ditto Ternes, $5.25@5.50; Coke Tin, $5.20@5.35, and ditto Ternes, $5@5.12½

SPELTER AND ZINC.

The market for spelter is dull Domestic is offered at 5 cents. Foreign is nominal 5¼ cents. We quote: Bertha Refined, 8c, and Bergenport, 9½c., while Sheet Zinc is also lower, say 6¼c.@6⅞c., without much demand at present

ANTIMONY.

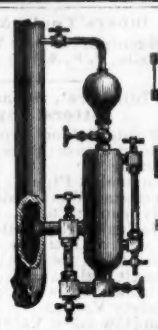
There is a steady demand at 11c. for Hallett's, and 13c. for Cookson's.

HARDWARE.

There has been a fair volume of trade in the hardware lines. Values are steady and we have no change of importance to note. In foreign hardware a fair amount of business is transpiring. There are not so many fresh orders, but the factories are all very busy; some of them report that they have enough booked to absorb their production for from four to six weeks. Prices for nails steady, 10d. @ 60d. $4.00 net, in carload lots and upward, with a slight advance on smaller orders.

LUMBER.

There has been increased trade at the Cleveland yards, and a greater firmness in prices is apparent. It is anticipated that with ordinary weather trade the remainder of the fall and during the winter will be good. Shingles have been firm at former quotations Lumber freights from Saginaw to this port are $2.75. There is a fair trade in hardwoods. The building activity continues sufficiently to call for a large amount of finishing lumber from various sources, principally cherry, white and red oak, ash, gum, walnut, and a share of mahogany, and the wood-working establishments which give attention to special plans for hardwood doors, and all sorts of inside work, are decidedly busy. Rates for the most part are shaded.



The Detroit
LUBRICATOR COM'Y'S
Sight Feed
LUBRICATOR
Cups.

For oiling valves and cylinders of steam engines, by the only perfect method, THROUGH THE STEAM PIPE. The oil passes IN SIGHT, drop by drop, into the column of steam where it vaporizes, thus becoming a STEAM LUBRICANT, oiling perfectly every part reached by the steam. Any CLEAN OIL, black or white light or heavy, may be used. Saves from 50 to 90 per cent. in oil and wear of machinery, thus paying for itself several times a year. A cup will be sent to responsible parties on twenty day's trial if desired. In ordering give diameter of cylinder.

NOTICE

The first Lubricators ever made, showing the oil passing drop by drop through a transparent water chamber, were devised by us, and the same are fully embraced by many Letters Patent owned and controlled by us, which have been sustained in several hotly contested legal contests. Our customers, therefore, need have NO FEARS IN THEIR PURCHASE AND USE. We are the sole owners of the "Sight Feed" feature as claimed by us, and we shall hold purchasers and users responsible who are encroaching upon our rights by the unfawful use of our device. Address,

DETROIT LUBRICATOR CO.
Office, 98 Griswold Street, Detroit, Mich.

Note—In our recent suit against the American Lubricator Co., of Detroit, before Justice Stanley Matthews, of the U. S. Supreme Court, involving their "sight-feed" feature, a decree was rendered in our favor August 20, 1881. (Mention this paper)

☞ WM. BINGHAM Sole Agent for this territory.

HEALTH A physician's gift to the debilitated—"Treatise on Cause and Cure of Nervous Debility" sent on receipt of two 3-cent stamps. Address Dr. CLEGG, CLEVELAND, O

LUMBER.

PLANK. MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2 uppers	$50
A 3	40
B	32
C	20
D	14
E	12

1¼ and 1½ inch.

A 1 and 2 uppers	$48
A 3	40
B select	32
C	20
D	15
E	13

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	19
D	14
E	12

STOCK BOARDS.
12 Inches wide.

A 1 and 2 uppers	$45
A 3	38
B	32
C	21
D	16
E	13

STRIPS.
6 Inches wide.

A 1, 2, and 3	$42
B	32
C	22
D	16
E	12
Norway Fencing Strips	17
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3	$42
B	35
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20
Beaded Ceiling $2 higher than Flooring.	
One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$14
Timber, longer than 20 feet and over $4 00 less than length.	@$6 00
Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$ 4 25
Clear Butts	3 25
Lath	2 75@3 00

Surfacing, one side, adds $1.25; two sides $1 50
Matching, flooring and drop sidings, $2.25.

LAKE FREIGHTS.

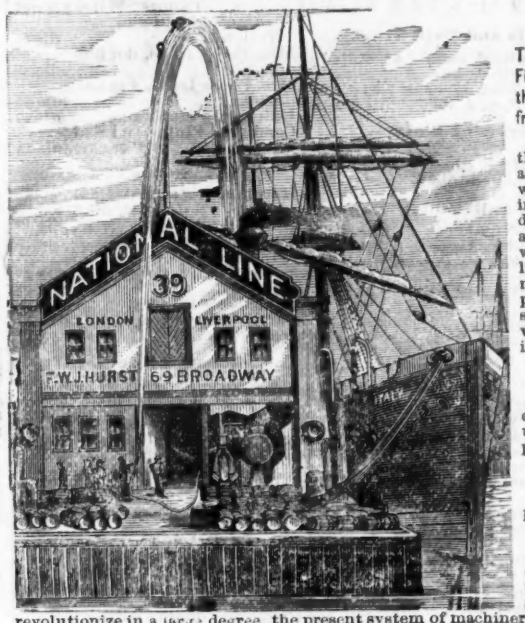
COAL.

Buffalo to Chicago	$ .62½@.65
Toledo to Chicago	1.00
Cleveland to Chicago	70@75
Erie to Chicago	70@75
Oswego to Chicago	1.50
Fairhaven to Chicago	1.80
Buffalo to Millwaukee	70@75
Cleveland to "	70@75
Erie to Milwaukee	75
Buffalo to Racine	80
Buffalo to Kenosha	85

IRON ORE.

Marquette to Lake Erie ports	1.25
Escanaba to Lake Erie ports	90@95
Escanaba to Chicago	90@95
Marquette to Chicago	1.15@1.20

THE NEW PULSOMETER
AS A FIRE PUMP.



The New Pulsometer makes a very efficient Fire Pump, the discharge can be carried through the building with branches leading from it for hose attachments.

"I specially desire to inform you of the working of the No. 7 New Pulsometer, as a fire extinguisher. We draw the salt water from the river, and through a 1¼ in. nozzle, have thrown it a perpendicular distance of 100 feet. In case of a fire on any part of the pier, the pump can be set working almost instantly. I congratulate you on the New Pulsometer and its many uses it can be applied to; every pier and warehouse where steam is used should not be without one. We are always ready to exhibit ours to those looking for a pump." GEO. L. ANDREWS, Wharfinger National Line, Pier 39, North River, N. Y.

"A No. 8 has furnished water for our entire works for over two years, causing us much less trouble than any other pump we ever used for that purpose." HOLMES, BOOTH & HAYDENS, Waterbury, Conn.

"We consider it the best pump that we have ever used." BROWN & BROTHERS, Waterbury, Conn.

"Our two New Pulsometers work to our entire satisfaction. We shall be surprised if the principles involved in this simple machine do not, at no distant day, revolutionize in a large degree, the present system of machinery for pumping." NICHOLSON FILE CO., Providence, R. I.

Descriptive book mailed upon application to

PULSOMETER STEAM PUMP COMPANY, 83 JOHN ST., NEW YORK,
Chicago Office, 193 Lake Street, FRANK GRAY, Manager. OR TO Boston Office, 32 Charlestown Street, S. B. EVERITT, Manager.

AIR FURNACE PROCESS.

MICHIGAN MALLEABLE IRON COMPANY:
Manufacturers of
REFINED
MALLEABLE IRON CASTINGS,
Detroit, Mich.

THE MORGAN
Variable Blast Water Tuyere Iron.

With the front plate removed, showing the rotating air tubes through which four different currents of air may be passed thereby making any sized fire from two to eighteen in. diameter

It actually saves one-half of the coal; makes an intense heat just where it is needed, and burns no coal unnecessarily Always gives a centre blast, and cleans all the dirt from the fire. Supplies hot water We also furnish a Tuyere on same principle without Water Attachment. All goods guaranteed to please or no sale. Catalogue sent free. Address, A. W. MORGAN & CO. 52 Vance Block, Indianapolis, Ind.

COATES'
"Independent Lock Lever"

HAY AND GRAIN RAKE.

Patented August, 1867, January, 1875, June, 1875, and November, 1876. 40,000 now in use. Light touch of lever and driver's weight dumps it. Best self-dump in market. Twenty steel teeth. No complicated ratchet wheels, friction bands or other horse machinery needed to operate it. A small boy rakes easily twenty acres per day with the Coates' Lock Lever. Send for circulars.

A. W. COATES & CO.
Alliance, Ohio.

W. S. IDE, President. R. T. CLARKE, Manager.
THE
VULCAN IRON WORKS CO.,
Builders of
IMPROVED
Forging Tools,
COLUMBUS, OHIO.

SPECIALTIES:
STEAM DROP HAMMERS,
STEAM HAMMERS,
POWER PUNCHES AND SHEARS AND POWER HAMMERS.

☞ CIRCULARS, PHOTOGRAPHS, AND PRICES FURNISHED ON APPLICATION.

The Vulcan Iron Works Company.

PURE PREMIUM BONE.

The tried and never failing Fertilizer in all grains and grass crops. It has proved its value as such by years of actual use all over the world. Circulars and Price List free. Address all letters pertaining to the purchase of Premium Bone, or the sale of bones, to Excelsior Fertilizer Works Salem Columbiana County Ohio.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's	per doz $18 40
Ship	" " 18 75
Heavy railroad	" " 19 50

Axes.

Hunt's	₰ doz $ 9 50
Lippincott's Crown	₰ doz 9 00
Cut More	₰ doz 9 00
Peck's Double Bit	₰ doz 22 00
"Champion Blade	₰ doz 11 00

Anvils.

Eagle, Amer.	per lb. 10c dis 20
Wright's	10¾c@11c
Armitage's Mouse Hole	9¾@9¾c
Trenton	10¾c
Wilkinson's	10¾c

Anvil Vise and Drill.

Millers' Falls Co. $28	dis 20
Cheney Anvil and Vise	dis 25&2

Vises.

Solid Box, list of July 1, '79,	dis 35
Solid "Crown" (A. H. Hildick)	40 to 100 ₰, 15c net
Solid, Peter Wright's	15¼
Solid, Wilkinson's	13¾
Parallel, Parker's	dis 0

Saw Filers. Hopkins' ₰ doz $17.50, dis 10

Reading	dis 45&10
Lowell Hand Vises	dis 20
Richardson's Vise and Anvil	dis 25

Augurs and Bits.

C S cut augers	dis 40&10
do do do bits	40&10
D C gimlet do Ives	dis 50
Snells bits	dis 40
Russell Jennings' augers	dis 16⅔ &10&10
Cook's pat augur	40&10

Animal Pokes.

Berea, per doz	4 00
Eagle, per doz	5 00

Apple Parers.

Domestic & Reading	₰ doz $7 50
Turn Table	00

Bolts.

Machine	dis 60
Bolt ends	dis 60
Plow	dis 50
Plow, R. B. & W	dis 40
Cast Iron Barrel Shutter, etc	dis 5 & 10
Cast Iron Chain (Sargent' list)	dis 60 & 10
Ives' Pat. Door Bolts	dis 50
Wrought Barrel	dis 55&10
Wrought Square	dis 55&10
Wr'g't Shut'r, all iron, Stanley's list	dis 50&10
Tire, R. B. & W., new list	dis 70&10
Stove, American Screw Co.'s	dis 40
Bolt Ends	dis 60

Bellows.

	Dis
Blacksmith's com new list, 45₰ct	
Moulder's new list, dis 25 ₰ cent	
Hand, new list, 25 per cent	

Butts.

	Dis
Wrought brass	65&10
Cast, loose joint	55
Pin, loose	50
Wrought, fast joint narrow	45
Wrought fast joint broad	45
Wrought loose joint broad	55
Wrought table and back flaps	45
Loose joint, without acorns	55

Ten per cent. extra dis for cash.

Cleveland Stamped Elbows

Genuine Russia Iron

4	inch	per doz 4 50
4½	do	do 5 50
5	do	do 7 50
5½	do	do 8 50
6	do	do 9 50
	do	do 11 00

Planished American Russia Iron

	inch,	per doz 4 00
4½	do	do 5 00
5	do	do 6 50
5½	do	do 7 50
6	do	do 8 50
	do	do 9 50

Charcoal Iron

4	inch,	per doz 2 00
4½	do	do 2 50
5	do	do 3 50
5½	do	do 4 00
	do	do 4 50
	do	do 5 50

25 per cent

Chisels.

Hot and cold cutting	₰ lb 30
Railroad track	30
Machinists	30
Mallet head	50
Cape	50
Packing	50
Stone cutters	50

Crowbars.

Cast steel	₰ lb 8¼
Iron, steel points	6¼c

Cutlery, Pocket and Table.

Meriden Cutlery Co, table	net
Am. Miller Bros.' Cutlery Co	dis 25
Humason & Beckley, pocket	33⅓
Naugatuck Cutlery Co	list net
Aaron Berkenshaw's pocket	dis 25

Coopers' Tools.

Bradley's	dis 14@2
Barton's	dis 20

Chains.

Coil by cask,

3-16	¼	5-16	⅜	7-16	½
10½	9	8	7	6¼	6¼

Drills and Drill Stocks.

Blacksmiths', each	$2.50 dis 10
Blacksmiths', self-feeding, each	7.50 dis 20
Breast, P. S. & W	dis 20&10

Drawing Knives.

Witherby's	dis 65@10
Nobles Mfgr. Co	15
Adjustable handle	20

Emery and Emery Paper.

Regular Numbers	₰ lb 6c
Flour and F. F	₰ lb 4c
B. & A. Emery Paper	dis 30&5

Enameled and Tinned Ware.

Kettles	dis 50
Sauce Pans	dis 25
Tinned Sauce Pans	dis 50

Files.

Auburn	$5 to £ dis 35 pr cent
E. M. Boynton's, new list	dis 25
J. & Riley Carr	4.50 to £
Johnson & Bro	dis 30
Butcher's	4.50 to £
Walter Spencer & Co.'s "Diamond"	4.50 to £.
Fisher's	4.75 to £
Moss & Gamble	4.50 to £
H. Disston & Sons (new list)	dis 40 per cent
Heller Bros.' Horse Rasps	dis 25
Nicholson	dis 40
New American	dis 40
Union File Co	dis 40

Grindstones.

Ohio	1¼@1½ ₰ lb
Nova Scotia	1¼@1½ ₰ lb

Hammers.

Maydole's	dis 15
Cheney's	dis 25
Hartford Hammer Co	dis 20
Humason & Beckley	dis 50
Verree	dis 5
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75,	dis 25&10
Nelson Tool Works	dis 40&10
Warner & Noble's	dis 5
Kip's	dis 15
Yerkes & Plumb	dis 15
Wilkinson's Smiths' 11¼c ₰ net	

Hatchets.

Yerkes & Plumb:--Shingling, Nos 1, 2, 3,	₰ doz $7 50, $8 00, $8 50, dis 25
Claw, No. 1, 2, 3,	₰ doz $8 25, $8 75, $9 25, dis 25
Lathing, Nos 1, 2, 3,	₰ doz $7 50, $8 00, $8 50, dis 25

Nails.

20 to 60d	$4 00
8 and 9d	25
6 and 7d	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅞ inch	3 00
4d barrel	1 00
1½ inch barrel nails	1 50
1⅛ do do do	1 75
1 do do do	2 50
⅞ do do do	3 00
Cut spikes, all sizes	25
Clinch nails, all sizes	1 75

Casing and box nails 75 cts advance

Finishing nails, $1 25 do

Tobacco nails, 50 cts do

Nuts and Washers

Nuts, square	7c off list.
Nuts, hexagon	6c. off list.
Washers	6c off list.

Picks.

Railroad,	4 to 5 lbs	doz $7 75
	5 to 6 lbs	7 75
	to 7 lbs	8 50
	7 to 8 lbs	9 50
Railroad Tamping Pick	7 to 8 lbs	doz 13 50
Mill Picks per lb		75c

Rivets.

Iron	dis 40
Tinned	dis 40
Copper	dis 33⅓

Squares.

Steel or iron, case lots	50
Try squares and T bevels	40

Spikes—WROUGHT

All lengths by ¼ inch	4½c
do do do 5-16	3½
do do do ⅜, 7-16 & ½ in	3¼

Shovels and Spades.

Ames' new list, July 1, 1881,	dis 15
Old Colony	dis 15
Remington's (Lowman's Patent)	dis 30
Rowland's	dis 40 and 10
Griffiths	dis 40&10

Saw Sets.

Boynton's patent X Cut, per doz $12; Hand Saw, per doz $10	dis 20
Stillman's Genuine, per doz $3 50 and $5 50	dis 20
Stillman's Imitation, per doz $3 25	dis 20&10
Common Lever, per doz $2	dis 30&10
Leach's No. 0 $8; No. 1 $15;	dis 15
Hammer, Hotchkiss $5 50,	dis 10
" Bemis & Call Co.'s new patent	dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer	dis 30&5
Bemis & Call Co.'s Plate	dis 10
" " Cross-cut	dis 12½
Aiken's Genuine	$13, dis 50&10
" Imitation	$7, dis 50
Hart's Patent Lever	dis 20
Disston's Circular	dis 40

Sad Irons.

From 4 to 10 lbs	per lb 3¾ net
Self-Heating	₰ doz $9 net
" Tailors	₰ doz $18 net
Gleason's Shield and Toilet	dis 25
Mrs. Pott's Irons, double pointed	dis 35
Mrs. Pott's Irons, square back	dis 35
Enterprise Star Irons	dis 40
Combined Fluter and Sad Iron	₰ doz $15, dis 15

Scales.

Hatch, Counter, No. 171	₰ doz. $42, dis 37½&10
Union Platform	$6, dis 45
Fairbanks'	dis 20
Buffalo Scale Co	dis 20&5
Forsyth Scale Co	dis 25
Howe's	dis 20&10
Chatillon's Eureka	dis 25
Family U. versal	dis 50
Scale Beams	dis 33⅓&10

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.	

Planes.

Ohio Tool Co	dis 25
Sc ota	dis 30
Bailey's Pat. Adjstble.	dis 20@25

Rules.

Stanley	dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"	42
Simmons' Sash Supporters	20

Hinges.

Champion double acting spring hinges	dis. 30
Screw & Strap 8@12 in.	$6. net
Gravity Locking Blind Hinges, Sargeant & Co.	70&10

Screws. Dis

Flat head iron or steel per cent dis	30
Flat head brass	30
Round head iron or steel	25
Round head brass	20
Brass and Silver capped	40
Japanned, list of Plain Screws	20
Coach, patent Gimlet point, list per 100	60
Lag, taper points	60
Bed	10
Machine, flat head, iron	55
round head, iron	50
Bench, iron	55&10
wood, beech, per doz $3	10
wood, hickory	20&10

Valves. Dis.

Jenkins' Patent Gate Valves	35
" " Globe "	40
" Standard Packing "	20

Wrenches.

Coe's genuine	40 & 10
Coe's imitation wrought bar	60
Mechanics'	60 and 10

Wire.

Brass and Copper	dis 20
Bright & annealed, Nos. 0 @ 18	dis 50@52½
" " Nos. 19 @ 26	dis 60
" Nos. 27 @ 36	dis 65
Coppered Nos. 0 @ 18,	dis 45
Galvanized, Nos. 0 @ 18, market list,	dis 40
Tinned, Nos. 0 @ 18,	dis 40@45
Cast steel	dis 40
Tinned Broom Wire, Nos. 18 @ 25	dis 55
Annealed Fence, Nos. 8 and 9	dis 55@52½
Annealed Grape, Nos. 10 to 14	dis 52½
Galvanized Telegraph, Nos. 7 to 9	₰ lb 7¼c
Galvanized Telegraph, Nos. 10 to 11	₰ lb 8¼c
Galvanized Telegraph, No 12	₰ lb 10½c
Fence staples	₰ lb 5½@5¾c
Fence Staples, galvanized,	₰ lb 7@7¼c
Stubs Steel Wire	$7 00 to £
Barb Wire, painted	8¼c
Barb Wire, galvanized	9¼c
Crucible Steel Ropes from ¾ in. at 9c to 1¼ in. at	52c
Best Selected Iron Ropes from 3-16 in. at 3c. to 1¼ in. at	33c

Boiler Plates.

("Gaylord"--Standard Quality.)

C. No. 1	1 50
C. H. No. 1 Shell	4 75
C. H. No. 1, 50,000	5 25
C. H. No. 1, 55,000	5 75
C. H. No. 1 Flange	6 50
Firebox	
T. S., 60,000 (as per)	6 50
T. S., 65,000 (act of)	
Homo. Steel, 70,000 (of Cong)	7 50
Heads, ½c ₰ lb extra	

N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ₰ lb less than above prices.

Sheet and Tank Rivets. "Norway."

All sizes	dis. 15

Boiler Rivets—" Albany "

⅛, ¼, 11-16, and ¼ in. diam.	5 50

Boiler Makers' Tools.

Doty's Power Shears	net list
" Hand Lever Shears	net list
" Power Punch	net list
" Hand Punch	net list
Steel Screw Punch	net list
Iron Screw Punch	net list
Boiler Plate Rolls	net list
Buffalo Forges & Blowers	dis 20
Watson's " "	net list
Spring Tube Expander	dis 15
Roller Tube Expander	net list
National Tube Cleaner	dis 20
Wire Flue Brushes	net list
Anvils—"Peter Wright"	12½ ₰ lb
Solid Box Vises	net list

Nuts, Bolts, etc.

Square & Hex. Nuts	7 50 list
Washers	list
Machine Bolts	dis 60
Bolt Ends	dis 60
Boiler Patch Bolts	net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch	dis 37½
"National" Standard Gauge 11 inch to 15 inch	dis 25
"National" Special Locomotive Tubes	net list

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	2 50
4¼ to 6 by ⅜ to 1 inch	2 60
1¾ to 6 by 1⅛ to 1½ inch	2 90
1¼ &1¾ by ⅜ to ¾	2 60
1 & 1¼ by ⅜ to ¾	2 70
⅝ ¾ and ⅞ by ⅜ to ⅝	2 90

Round,

1 to 1⅞ inch	2 50
2 to 2⅝	2 70
2¾ to 3¼	3 00
3¾ to 4	3 50
4¼ to 4½	4 00
4¾ to 5	4 20

Square.

1 to 1⅞ inch	2 50
2 to 2⅝	2 70
2¾ to 3¼	3 00
3½ to 4	3 50
⅝ to ⅞	2 60

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 70
1 to 1¾ by ¼ and 5-16 do	2 80
⅝ to ⅞ by ¼ and 5-16 do	3 00
⅝ to ¼ by ¼ and 5-16 do	3 50

Half Oval and Half Round.

Wagon box iron ⅝ and ⅞ .. 4 00

1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¼ to 6 by ⅛ to 3-16	3 00

Hoops.

1¼ to 2 , Nos 16 to 18	3 40
1¼ to 4 do 13 to 15	3 30

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	4 50
No 25 to 26	4 70
No 27	4 90
No 28	5 30

English Steel.

Best cast	₰ lb 15½c
Extra cast	16¼c
Round machinery, cast	10c
Swaged, cast	18c
Best double shear	15½c
Blister, 1st quality	13c
Refined tool steel	16¾c
Spring calking	7¼@7¾c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15½c
2d quality	14½c
3d quality	12¾c

American Steel.

Best brands of refined cast steel, ¾ to 2 inches	12c
Crucible cast	7c
Open-hearth ditto	4½c
Hammer cast steel	9c
Spring cast steel	7½c
Bessemer and open-hearth spring	5c
Ditto plow	4½c
Steel boiler plate	6½@7c
Bessemer machinery	5 @6c
Spring and calking	7¼@7½c
Tire	5
Sleigh shoe	5

Bessemer Steel Tire.

¾ to 1 by 3-32	4½ ₰ lb
¾ to 1 by ⅛ to 5-32	4½ ₰ lb
¾ to 1 by 3-16 to ¼	4½ ₰ lb

Miscellaneous Cast Steel.

Auger and auger bit	1
Axle steel for wagons	7
Frog points and plates	8
Frog size bars	8½
Pick, hammered	10
Mattock, beveled	9
Table cutlery	7½
Trap spring steel	10
Pike and cant hook	9
Coal and granite	8½

TINNER'S STOCK.

Tin.

Banca,	per lb. 26c
Straits	" 26c
English	" 27c
Bar	" 27c

Tin Plate,

IC 12x12 charcoal	$ 6 50
IC 14x20 do	6 25@6 50
IX 14x20 do	8 25
DC 12½x17 do	6 00
DX 12½x17 do	8 00
DXX, 12½x17 do	10 00
DXXX, 12½x17 do.	12 00
IC, 20x28 do	14 50
IX, 20x28 do	15 50
IC, 14x20, Best Roof	6 00
IX, 14x20, do	8 00
IC, 20x28 do	13 00
IX, 20x28 do	14 50
IC, 10x14 Best Coke	5 75

Solder.

Half and Half, in bars	15¼
No. 1 do	14¼
Spelter Solder	25

Pat Planished Sheet Iron.

[A]	per lb 10½c
[B]	9¾c

Nos	10	15	21	25
	to 14	20	24 & 26	
Com	3-60	3-80	4-00	4-20
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra

Zinc.

Sheet, cask	8c
Sheet, open	8@ 8½

Inners' Tools & Machin

Machines (P. S. & W.)	list add 20
Tools (P. S. & W.)	add 6

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe	dis 60.
Steam Brass Goods	dis 45
Water " "	dis 40
Enameled Pipe	di 65
Artesian Well Casing	net list
Hydraulic Tubes	net list
Malleable Iron Fittings	net list
Cast Iron Fittings	dis. 45
Globe Valves	dis. 35
Angle Valves	dis. 35
Check Valves	dis. 45
Safety Valves	dis. 35
Ludlow Gate Valves	dis. 20
Ball Gauge Cocks (net per dozen)	$15
Compression Gauge Cocks	dis. 35
Montg'ry Gauge Cocks	dis. 35
Register Gauge Cocks (net per piece)	$1 00
Cylinder Cocks	dis. 30
Air Cocks (net per dozen)	$2 75
Oil Cups	dis. 30
Steam Gauges	dis. 40
Water Gauges	dis. 40
Scotch Glass Tubes	dis. 50
Steam Whistles	dis. 45
Pipe Tools	special
Globe, Angle and Check Valves (Star's regrinding)	dis 25
Duplex Injectors	net. 20
Soil Pipe & Fittings	dis. 20
Sinks	dis. 25
Bath tubs &c.	dis. 20

Babbitt Metal.

Babbit Metal, No. 4	8c
Babbot Metal, A No. 1	12c
Babbit Metal, J. B.	85c
Babbit Metal, genuine	35c

LEAD.

American,	₰ lb 5c
Bar,	₰ lb 6½c dis 10 per ct
Pipe,	₰ lb 7½c dis 10 per ct
Sheet,	₰ lb 8c dis 10 per ct
Tin-lined pipe	₰ lb 15c dis 10 pr ct
Shot Drop 7c; Buck	7c
Chilled Shot	8c

COPPER.

Lake Ingot	18¼@18¾c
Baltimore	17¾@17¾c
Arizona	17⅜@17⅜c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb	30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq foot, per lb.	32c
Brazier's Copper, 10 oz and 12 oz per sq ft. per lb.	34c
Brazier's Copper lighter than 10 oz per sq ft. per lb	36c
Circles less than 84 inches in diameter per lb.	33c
Circles 84 inches in diameter and over per lb.	30c
Segment and Pattern sheets per lb.	33c
Locomotive Fire Box sheets per lb.	30c
Sheathing Copper, over 12 oz per sq. ft per lb.	28c
Bolt Copper per lb.	30c
Copper Bottoms per lb	31@32c

No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18	per sheet 6c

All other size sheets, 2½c per square foot For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

	Net Tons.
No. 1 wrought scrap	$24
Sheet and hoop "	10@11
Cast scrap, (No. 1 heavy)	19
Cast Scrap (Stove Plate)	12

OLD METALS.

Old copper per lb	15c
No. 1 H. Brass per ₰	14
Heavy yellow Brass do	12
Light Brass per ₰	8
Scrap Zinc per ₰	3½
Tea Lead per ₰	4
Heavy Lead per ₰	3

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan. or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛	08		.40	.24
¼	08	$0 11	.54	.42
⅜	09	12	.67	.56
½	11	15	.84	.85
¾	13½	19	1.05	1.13
1	19	28	1.31	1.67
1¼	27	40	1.66	2.26
1½	33	47	1.90	2.69
2	46	64	2.37	3.66
2½	75	1 00	2.87	5.77
3	95	1 30	3.50	7.55
3½	1 25	1 70	4 00	9.05
4	1 50	2 05	4.50	10.73
4½	1 75	2 40	5.00	12.49
5	2 25	3 00	5.56	14.56
6	2 75	4 00	6.62	18.76
7	3 75	....	7.62	23.00
8	4 75	....	8.62	28.00
9	6 50	....	9.68	34.40
10	8 00	....	10.75	40.64
12	12 00	....		54.65

Discount, 62½ per cent; galvanized, 62½ per cent.

BRASS,

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Brass

All Nos not thinner than No. 28, wider than 2 in. not wider than 14 inch	30c
All Nos to No. 28, inclusive, and widths over 14 to 20 in. inclusive	35c
All Nos. to No. 28, inclusive, and widths over 20 to 30 in. inclusive	38c

¼c per lb. advance on each No above Nos. 28 to 38, inclusive.

All Brass thinner than No. 8 is Platers' Brass at 53c

Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c per lb. more than High Brass.

Gilding metal 8c per lb. more than High Brass.

Platers' or Gold Metal

In Bars	48c
Sawed	51c
Planed or Polished	54c

For Slitting.

Metal in width in. to ⅛ in. to No 28, inclusive, 1c per lb advance.

Metal, in width 2 in. to 1 in., thinner than No. 28, 2c per lb advance

Metal, in width ⅛ in. to ¼ in. thinner than No. 28, 5c per lb advance.

Metal ¼ in. in width and less, 10c per lb. advance.

Any of the above widths cut to particular lengths, add 7c per pound.

COAL,

WHOLESALE.

Wholesale f.o.b. vessel at Cleveland:

Carbon Hill and Monday Creek	$2 65
Massillon	2 75@ 2 85
Brier Hill	3 25@3 75
Pittsburgh	3 00
Salineville	2 25
Tuscarawas	2 25

RETAIL.—Delivered.

Massillon Lump	$4 00
" Nut	3 75
Carbon Hill and Monday Creek, lump	3 75
Carbon Hill and Monday Creek, nut	3 50

75c less on cars by car load.

Anthracite Stove and Chestnut	7 15
Egg and grate	6 00

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15	
11x14 to 15x24	8 50
16x24 to 20x28	9 75
15x34 to 24x30	10 75
26x28 to 24x36	11 50
26x36 to 26x44	13
26x46 to 30x50	14 00

DOUBLE THICKNESS

6x8 to 10x15	11 7
11x14 to 15x24	13 25
16x24 to 20x28	15 75
15x34 to 24x30	17 25
26x28 to 24x36	18 50
26x36 to 26x44	21 25
30x50	22 50
30x52 to 30x54	23 25
30x56 to 34x56	25 00
34x58 to 34x60	27 75
36x60 to 40x60	30 00

Dis 60 & 15 single, 60 & 20 double

OILS.

Pure Oils. packages included

Sperm, winter bleached per gal	1 25
Whale, winter bleached per gal	68
Straits	50@53
"A" oil for tanner's use	35 @40
Lard oil extra W S	1 03@1 10
do No 1 do	82@87
do No 2 do	72@77
Tallow oil	75
Neatsfoot oil pure	90@95
do No 1	80@85
Linseed oil, raw	54
do do boiled	57
Cotton seed oil white	64 @ 66
do do yellow	60 @ 63
West Virginia lubricating 28 deg	20c@30c
Pure Mecca	55@ 50
Paraffine oil winter pressed	25@ 30
Machinery	40
Engine	50
Miners' oil	40@45
Drilling oil	40

Hides and Leather.

Prime cured hides	8¾@9
Green hides	5@6
Bull, scrubby, badly scored or damaged, cured, two-thirds price.	
Prime dry hides	13@14
Horse hides, green	No. 1, $2 00
Prime cured veal calf	12@12½
Ohio Deacon S, salted	60
Pelts, wool on	25@30
Fresh slaughter sheep	30@$1 50
Fresh slaughter lambs	50@60
Green calf skins	15
Hemlock rough	23@24
Oak harness	34@38
Oak sold	37@4
Union harness	31@ 0

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W. E, Ana ytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers

SMITH & TEACHOUT—(Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron, Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore au Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .93 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furniture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 208 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 177 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Electrical,

ELECTRIC SUPPLY CO. manfrs'and dealers in Electric Burglar Alarms, Annunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 332 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 22 & 24 Power Block.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL. Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed umber, timber, lath shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers i n lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils, 23 Euclid ave.

Cleveland Business Directory.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals. Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers 52 Canal Street.

REID, J. C., Pattern and Model Maker. 52 Canal Street., (Up Stairs.)

COTTRELL & CO., W. L., Pattern Makers, 53 Center street.

STAIR BUILDER.

PFEIL, CHAS, Stair Builder; Hard Wood Mantles and Office Railing. Works, 49 & 51 Canal street, Cleveland, Ohio

Steel Stamps and Stencils,

FLEHARTY, J. H. & CO, Rubber Stamps, Seals, Stencils. 197 Superior street.

Steam Furnaces.

CUYAHOGA STEAM FURNACE CO., Manfrs of Land and Marine Engines Machinery for Blast Furnaces, Rolling Mills, Bessemer Steel Works, &c. Mill-Gearing and all kinds of Castings, Foundry, Machine and Boiler Shops.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 56 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

AKRON POLISHING & PLATING WORKS. Man'f'rs of solid leather wheels for polishers.

Alliance, O.

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing

Buffalo, N. Y.

SANDS, PAUL, Marine and Stationary Steam Engine Works mfr. of drilling machines, foot and power lathes. 70 Columbia street.

EMPIRE STATE MF'G CO., O. F. Swift, prop'r. manfr of Fluters, Sad Irons, Spun Copper & Half Copper Tea Kettles. Washington, cor. Ohio

WHITE, L. & I. J. manf'r's of Coopers' Tools, Carpenters' Tools, and Ship Tools Also manf'r's of Planer Knives and Machine Cutters to order 310, 312, 314 Exchange street.

THE BUFFALO NUT AND BOLT CO [Limited.] Manufrs. of Hot Pressed Nuts, Bolts, Washers, Rivets, &c. No. 226 Ohio Street.

Cuyahoga Falls, O.

THOMAS BROTHERS, manfrs of Ohio Stone Ware. Cuyahoga Falls Stone Ware Factory, cor. Main and Broad streets,

TURNER, VAUGHN & TAYLOR, manufacture engines, presses and grinding machinery for clay; also paper, chain, wire and flour mill machinery. Send for Circulars and price list.

SNYDER, H. wholesale manu acturer of Sash, Doors, Blinds, &c. Send for Price Lists.

THE CUYAHOGA FORGE AND IRON CO., manfrs. of every description Car, Truck and Driving Axles, Forging, Shafting, &c.

Wheeling, W. Va.

EXCELSIOR MACHINE WORKS, Redman & Co., general machinists and manufacturers of Marine and Stationary Engines, Hangers, Pulleys, Shafting, &c. Cor. 18th & Chapline streets.

Business Directory.

Canal Dover, O.

HECKMAN, E., manufr. and dealer in harness leather, upper, kipp and calf. Also, manufacturer & dealer in prime English Dairy cheese. Highest market cash price paid for hides.

Columbus, O.

PAT. ADJUSTABLE WINDOW CURTAIN Cornice, manufactured by Strader's Curtain Cornice Works.

ROYCE & PULLING manufrs of Patent Steam Pumps for all purposes. Store room 30 High street. Works Nos. 5 and 7 Scioto street.

U. S. CARRIAGE CO. builders of fine Carriages, Buggies and Phætons. Salesrooms and Office 257, 259 and 261 Fourth street.

REYNOLDS BROS., manufacturers of hand-cut Files and Rasps. Old files re-cut. Send for Price List.

CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted. Borger Bros. & Co.

MURRAY, HAYDEN & CO., manfrs of Malleable Iron. Cor. Randolph & West streets.

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes, Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE, Canton. Fred. Hipp, Prop.

Erie, Pa.

GUNNISON, A. B., wholesale manufacturer of Wood Pumps. 233 East Twenty-Second St.

BALL ENGINE CO., limited, manufacturers of Automatic Engines of 15 to 80 horse power

NOBLE SEWING MACHINE CO. manfrs of the New Noble Sewing Machine. Send for circulars and prices.

A. B. FELGEMAKER & CO. Church Organ builders. Descriptive catalogue furnished on application.

Geneva, O.

THE ENTERPRISE MACHINE CO., L. L. Crane, Pres't, manfrs of Machinists' Tools and Machinery. Gear Cutting a specialty.

Lima, O.

LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

Meadville, Pa.

CURRY & CO. general jobbers in Castings of all kinds.

Olean, N. Y.

MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc.

Oil City, Pa.

REID, JOS. Machinist, steam engine and pump repairing. Brass and sron castings, light and heavy, made on short notice.

Pittsburgh, Pa.

PRINTING PRESSES. W. A. Bunting. manufacturers' agent. Printers supplies, type, cards. 42½ Sixth Street. [Up stairs.]

BAIR & GAZZAM, practical machinists; gear cutting a specialty. Rice's Feed Water and Heater. 17 Wood street, corner First Avenue.

Painesville, O.

NORTH AMERICAN CUTLERY CO., m'fr's of Steel Shears and Scissors—best quality.

Ravenna, O.

THOMPSON, T. F., dealer in Agricultural Implements, farm machinery, hardware, seeds, fertilizers, &c. Cor. Main and Prospect sts.

BALDWIN, D. L. & SON, Contractors & Builders and manfrs of all kinds of Moulding, flooring, siding, &c. Rip, Band and Scroll Sawing.

Rheims, N. Y.

GREAT WESTERN CHAMPAGNE. Finest made in America. Equal to best imported. Has taken highest awards everywhere, and is used all over the Continent. Try a case, and you will have no other. Pleasant Valley Wine Co., Rheims, N. Y.

Rochester, N, Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches, spike, mall, chisels, &c.

ELEVATORS for Hotels, Factories and Private Houses. J. S. GRAHAM & CO.

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. GRAHAM & CO.

RAZOR STROPS. Sole mfrs. of all kinds of Razor Strops. Uischt, Linn & Co. 131 N. Water

Steubenville, O.

DORRANCE, D. W., Tool Works, manufacturer of hand-made miners' and stone-cutters' Tools Promp attention given to mail orders.

Sandusky, O.

SANDUSKY WHEEL CO. manfrs. of Sarven Patent Wheels, Carriage Bodies and Seats, Plain Wood Hub Wheels, Banded Hub Wheels, Jacob's Patent Neck Yokes.

Sandy Lake, Pa.

EBERMANN, W. S. & SONS, manfrs. of the celebrated Ebermann Boiler Feeder. Send for Circulars and Price List.

Business Directory.

Titusville, Pa.

FOSTER & MCKAY, dealers in boilers and engines, tubing, casing, old iron, rope, and all kinds of metals. Washington street, nr. Railroad.

Toledo, O.

BAKER, HERBERT, Machine Shop and Iron Foundry. 98 and 100 Erie street.

TOLEDO FOUNDRY AND MACHINE CO. builders of Steam Engines, Circular Saw Mills and all kinds machinery. Water St., cor. Cherry

RUSSELL IRON WORKS, mnfrs. of Architectural Iron Work, castings, pulleys, shafting and steam bending machinery. Cor. Water and Lagrange streets.

STANDARD SAW WORKS, H. Bartley, manufacturer and dealer in Saws of every description. All kinds of Springs made from Sheet Steel. Reaper, Hay Knives Truss Springs, &c. made to order. 92 St. Clair Street.

UNION Wooden Ware Manufacturing Co. manufacture Sewing machines, washboards, children's wagons, carts, wheelbarrows, sleds, kitchen wooden ware, &c.

HEPBURN BROTHERS, proprie. Union Boat Works. Boats of all kinds made to order. For sale or rent. Water Street foot of Cherry.

Union City, Ind.

LAMBERT, J. W. & CO., mfrs of fork, rake, hoe and broom handles; spokes, hubs, whiffletrees, yokes, plow-rounds. &c. Correspondence solicited.

Youngstown, O.

BELL, EDWIN & SON, manuf. of Nail Kegs, Pat. coiled hoops, slack barrel and keg heading and oil barrel stock.

DINGLEDY, G. H. dealer in rough and dressed Lumber, Shingles and Lath.

MORTON HOUSE, formerly Maitland House, James Morton, Prop.

TOD HOUSE, cor. Diamond and Market streets. Henkel & Bowman, Props.

Zanesville, O.

KIRK HOUSE, William Kirk, proprietor. $1.50 per day.

Brattleboro', Vt,

A JOY FOREVER!

ESTEY ORGANS

Manufactured by

J. ESTEY & CO.,

Brattleboro', Vt.

(Catalogue free on application.)

CLEVELAND NON-CONDUCTING CO.

MANUFACTURERS & DEALERS IN

ASBESTOS, HAIR FELT, CEMENT, & OTHER

Pipe Coverings,

19 SOUTH WATER STREET, CLEVELAND, OHIO.

T. NEW'S PREPARED ROOFING

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free.

T. NEW, 32 John St., New York.

Barrett, Arnold & Kimball,

Western Agents, Chicago, Ill.

E. F. ENSIGN,

JOBBER OF

Agricultural Implements,

WAGONS, FERTILIZERS, SEEDS, &C.

The Empire Grain and Fertilizer Drill and Twine Binding Harvesters Specialties.

134 ST CLAIR STREET, CLEVELAND, O

TRAVELERS' REGISTER.

Lake Shore & Michigan Southern.

TRAINS GOING EAST.	Arrive. From West.	Depart. From East.
Fast N. Y. Express	*1 35 a m	*1 50 a m
N.Y.,Boston & AtlanticEx.	*7 05 a m	*7 30 a m
Elyria Accommodation	†8 35 a m	.....
Pt.Clinton Accommodation	†11 00 a m	.....
Buffalo Accommodation	†11 00 a m	†11 15 a m
N. Y and Boston Fast Ex.	*2 25 p m	*2 55 p m
Conneaut Accommodation	.....	†4 50 p m
Night Express	†10 10 p m	†10 35 p m

TRAINS GOING WEST.	Arrive. From East	Depart. From west.
Fast Limited Express	*12 23 a m	*12 33 a m
Mich. Ex. via Sandusky	*2 50 a m	*3 05 a m
Chicago Ex. via Sandusky	†6 35 a m	7 00 a m
Mich. Accom. via Norwalk	.....	†6 40 a m
Conneaut Accommodation	†8 40 a m	.....
Toledo Ex. via Norwalk	†1 25 p m	†3 30 p m
St. Louis Ex.via Sandusky	*1 40 p m	*2 05 p m
Chi. Pac. Ex. via Norwalk.	*7 05 p m	*7 35 p m
Pt.Clinton Accommodation	.....	†5 00 p m

Sunday trains for Nottingham—Depart 0:00 a m m. and 2:15 p. m., return at 10:05 a. m. and 4:45 p. m.

Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'polis Ex.	*7 10 A.M
No. 8 C. T.V. & W. & Clev Accom	10 30
No. 12 St. Louis & New York Exp.	*3 00 P.M
No 6 Indianapolis & Columbus Exp	10 20
No 4 Columbus & Cincinnati Exp	*3 40
No. 10 Wheeling Express	7 15

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	*8 00 A.M
No. 11 Cleve, Indianap. & Wheel'g Ex.	7 10
No. 3 Special St. Louis & Cincinnati Ex**	1 55 P.M
No. 5 Night Express,	*7 25
No. 7 C.T.V. & W. & Col.Accom	4 00

**This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

Wheeling & Cleveland Express	8 25 P.M
Uhrichsville Express	10 30 A.M

DEPARTURES.

Wheeling & Cleveland Express	7 15 A.M
Uhrichsville Express	4 00 P.M

New York, Pennsylvania & Ohio.

ARRIVALS.	a.m.	a.m.	p.m.	p.m.
Through from East	6 50	.....	.....	*7 00
N.Y. P. & O. (Mahoning)	10 55	.....	2 00	*7 00
Pittsburgh Express	.....	.....	2 00	*7 00
Pittsb'g& Youngs'tn Ac.	10 55	.....	.....	10 15

DEPARTURES.	a.m.	a.m.	p.m.	p.m.
Through Eastern Train	*7 10	.....	.....	10 45
N. Y. P. & O.(Mahoning)	.....	.....	.....	4 25
Youngs'tn & Pitts'bg Ac.	.....	11 00	.....	.....
Pittsburgh Express	.....	*7 10	*2 30	.....

Cleveland & Pittsburgh.

	ARRIVE.	DEPART
Pittsburg & Wheeling	1 45 P.M	8 50 A.M
Express	6 55	2 30 P.M
Alliance Accommodation	10 15 A.M	3 45
Ravenna Accommodation	8 35	5 35
Night Express	6 30 A.M	†11 40 P.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.		DEPARTUPES.	
No. 2 Accom.	10 15 A.M	No. 1 Mail	8 15 A.M
No. 6 Express	1 35 P.M	No. 3 Accom.	2 30 P.M
No. 4 Mail	6 30 P.M	No. 5 Exp.	6 05

Special trains leave on Sunday at 8.25 A. M. and 4.20 P. M., arriving at Cleveland at 10 A. M. and 6.25 P. M.

Trains leave from Depot foot of South Water Street.

Connotton Valley Railway.

Arrive.		Depart.	
No. 1	10 05 A.M	No. 4	9 15 A.M
No. 3	6 40 P.M	No. 2	4 05 P.M

All trains arrive and leave depot corner Commercial and Fifth Streets

Cleveland, Akron & Columbus Railroad.

Cleveland, Akron & Columbus Railroad, running over Cleveland & Pittsburgh Railroad to Hudson, for Akron, Columbus, etc

	ARRIVE	DEPART.
Mail	1 15 P.M	8 00 A.M
Express	7 25	1 50 P.M
Accommodation	10 10 A.M	3 45 P.M

CLEVELAND & PITTSBURGH

RAILROAD.

Trains leave Cleveland and arrive at the points named below as follows: Night Express runs daily, all other trains dail except Sundays

	Mail.	Fast Line.	Accom.	Night Expr'ss.
Leave Cleveland	8 50 am	2 30 pm	3 45 pm	11 40 pm
Arrive Hudson	10 00	3 28	4 50	12 50 am
Ravenna	10 40	3 58	5 50	1 18
Alliance	11 25	4 25	6 05 pm	2 05
N. Philadel	11 35 pm	7 15	.....	10 55
Salem	12 25	.....	.....	3 02
Canton	12 28	5 47	.....	3 20
Massillon via Alliance	12 50	6 06	.....	3 38
Akron	10 42 am	4 10	5 40 pm	.....
Pittsburgh	3 30 pm	7 45	.....	6 55
Wheeling	5 10	8 00	.....	8 55
Marietta	8 45	.....	.....	.....
Harrisburg	.....	4 15 am	.....	4 00 pm
Philadelphia	.....	7 50	.....	7 35
New York	.....	11 15	.....	10 35
Baltimore	.....	7 55	.....	7 20
Washington	.....	9 17	.....	8 47
Boston,	.....	8 00 pm	.....	.....

Ravenna Accommodation leaves Cleveland at 5:30 p m, reaching Ravenna at 7:15 p m; Akron 2:3 p m.

Newburgh Accommodations leave Cleveland at 11:00 a m and 12:30 pm. Returning, leave Newburgh at 11:10 am and 1:30 pm.

Passengers for New York, Philadelphia, Baltimore, Washington, and all points east of Pittsburgh make but one change of cars, viz. at Union Depot, Pittsburgh, excepting those leaving on the Fast Line which has Pullman Sleepers from Cleveland to Philadelphia and New York.

The Fast Line leaving at 2:30 P. M. has elegant Pullman Palace Sleeping Cars through from Cleveland to New York without change. Pittsburgh Passengers who desire Parlor Car accommodations can secure seats in this car.

The Night Express has Pullman Sleeping Cars from Cleveland to Pittsburgh which can be occupied by passengers at Union Depot, Cleveland, any time after 9:00 P. M. At Pittsburgh passengers can take elegant through Parlor or Sleeping Cars for the East.

Sleeping and Parlor Car accommodations from Cleveland and Pittsburgh eastward can be secured at the Union Sleeping and Parlor Car Office Union Passenger Depot; of H. C. Marshall, Union Ticket Office, Weddell House; or of the Ticket Agent at the Euclid Avenue Station.

Through tickets can also be secured at the same points. Baggage checked through from the Union Depot or from Euclid Avenue Station.

By the 8:50 A. M. train a through car leaves daily for Akron, Gambier, Mt. Vernon, Columbus and immediate points, without change.

The 2:30 P. M. train has through car for Akron, Orrville, Columbus and immediate points, arriving in Columbus at 9:25 P. M.

By the 3:45 P. M. Accommodation train cars run through without change from Cleveland to Cuyahoga Falls, Akron and Millersburgh,

Night Express leaving Cleveland at 11:40 P. M., runs daily, and makes connection at Wellsville for Steubenville, Bridgeport, Wheeling, Bellaire and intermediate points. Every night in the week except Saturday the night express runs via Wellsville. On Saturday nights it runs via Alliance. All other trains run daily except Sunday.

Trains arrive at Cleveland.—Night Express at 6:30 P. M., having Pullman Sleeper from Pittsburgh; Ravenna Accommodation, 8:35 A. M., Alliance Accommodation, 10:15 A. M.; New York Wheeling & Washington Mail, with Pullman Sleeping Car from New York and Philadelphia, 1:45 P. M.; New York, Philadelphia & Wheeling Express, 6:55 P. M.

WM. A. BALDWIN, General Manager. **E. A. FORD,** Gen'l Pass. & Tkt. Agt. Pittsburgh, Pa.

C. L. KIMBALL, District Passenger Agent, corner Bank and St. Clair streets, Cleveland.

Cleveland to New York,

VIA THE

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Formerly Atlantic & Great Western Railroad.]

For New York, Boston and the East. The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 7:48 p.m; Washington, 7:30 a.m.; Baltimore, 8:19 a.m.; via Sharon and Meadville, 7:00 p. m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:25 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m. Pittsburgh, 10:48 p. m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 9:50 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 12:45 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:33 a.m., and 1:18 p.m. and 4:20 p.m.

11:00 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 1:50 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 7:00 p.m., 10:55 a.m. 2:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

A. E. CLARK, Gen. Pass'r. Agt., Cleveland, Ohio.
M. L. FOUTS, Pass. Agt., 131 Bank st., Cleveland.

J. M. FERRIS, Gen. Man'gr. Cleveland

NOTICE.—Hereafter all Passes must be returned to the General Passenger Agent within FIVE DAYS after date of expiration; otherwise they will be discontinued.

Blue Grass Route of Ohio

TIME TABLE.

The Cleveland, Mt. Vernon and Delaware RAILROAD.

GEO, D. WALKER, RECEIVER.

SOUTH-BOUND TRAINS

STATIONS.	Accom	Accom	Expr	Mail	Sundays only
Leave.	P. M.	P. M.	P. M.	A.M.	P. M.
Cleveland	5.30	3.45	2.30	8.50	.....
Hudson	6 53	5.02	3.35	10.10	4 20
Cuyahoga Falls	7 11	5.20	3.53	10.29	4 40
Akron	7 23	5.46	4.10	10.42	5 00
*North Portage	P M.	6.00	4 24	10.54*	6 14
Clinton	.....	6 19	4.44	11.09	5 31
Warwick	.....	6 29	4.49	11.14	5 37
*Marshallville	.....	6 43	5.02	11.27*	5 50
Orrville	.....	6 58	5.14	11.42	6 02
*Apple Creek	.....	7.17	5 32	11.58*	6 22
Fredricksburg	.....	7.32	5.45	12.11	6 37
*Holmesville	Accom	7.43	5 55	12.21*	6 48
Millersburg	7.55	6.08	12.34	7 00	
	A. M.	P.M.			A.M.
Millersburg	5.50	.....	6.08	12.34	7 00
*Killbuck	6.02	.....	6.20	12.47*	7 12
*Black Creek	6.13	.....	6.31	12.59*	7 25
Gann	6.33	.....	6.51	1.19	7 47
	6.53	.....	7.11		
Danville	7 04	.....	7.20	1.29	7 59
Howard	7.13	.....	7.29	1.38	8 10
Gambier	7.22	.....	7.38	1.47	8 20
Mt. Vernon	7.35	.....	7.51	2.00	8 33
*Bangs	7.45	.....	8.01	2.11*	8 45
*Mt. Liberty	7.53	.....	8.09	2.20*	8 54
Centerburg	8.05	.....	8.18	2.30	9 05
*Condit	8.19	.....	8.32	2.44*	9 19
*Sunbury	8.27	.....	8.40	2.58*	9 28
*Galena	8.32	.....	8.45	2.58*	9 34
Westerville	8.48	.....	9.00	3 15	9 50
Arrive at Columbus	9.15	....	9.25	3.40	10 20
	A M		P M.	P.M.	A.M

NORTH-BOUND TRAINS.

STATIONS.	Expr	Mail	Accom	Accom	Sundays only
Arrive at	P M	P.M.	A. M.	A. M.	A.M.
Cleveland	1 45	6 55	10.15	8.30	.....
Hudson	12 35	5.48	8.53	7.15	10.30
Cuyahoga Falls	12.16	5 30	8.33	6.58	10.11
Akron	12.03	5.17	8.20	6.45	9.50
*North Portage	11.46	5.00*	8.03	A. M.	9.34
Clinton	11.30	4 44	7.46	.....	9.18
Warwick	11.25	4 37	7.37	.....	9.12
*Marshallville	11.10	4.27*	7.23	.....	9.00
			7.10		
Orrville	10.57	4.14	6.40	.....	8.47
*Apple Creek	10.40	3.56*	6.22	.....	8.27
Fredricksburg	10.26	3.43	6.08	.....	8 13
*Holmesville	10 16	3.33*	5.58	Accom	8.02
Millersburg	10 05	3.22	5.45		7.50
			A. M.	P. M.	P.M.
Millersburg	10 05	3.22	.....	8 35	7.25
*Killbuck	9 51	3.08*	.....	8.23	7.13
*Black Creek	9.39	2.57*	.....	8.11	7.06
Gann	9.17	2.36	.....	7.49	6 38
Danville	9.07	2.27	.....	7.39	6.25
Howard	8.58	2 18	.....	7.29	6.14
Gambier	8.49	2 09	.....	7.14	6 03
Mt. Vernon	8.37	1.57	.....	7.02	5.51
*Bangs	8.22	1.40*	.....	6.46*	5.37
*Mt. Liberty	8.14	1.31*	.....	6.37	5.28
Centerburg	8.05	1.22	.....	6.28	5.17
*Condit	7.51	1.09*	.....	6.14	5.03
*Sunbury	7.42	1.01*	.....	6.06	4.53
*Galena	7.37	12 56*	.....	6.00	4 47
Westerville	7.20	12 40	.....	5.43	4 30
Leave Columbus	6.55	12.15	.....	5.15	4.00
	A M.	P M		P. M.	P.M.

* Stop on signal. B Breakfast. S Supper.

Special Round trip rates will be made for Sunday trains.

The Blue Grass Route of Ohio (Mt. Vernon line) will abandon their regular Sunday trains after September 10th, 1882.

N. MONSARRAT, Gen'l Supt. Akron, O
E. T. AFFLECK, General Passenger Ag't, Columbus, O.

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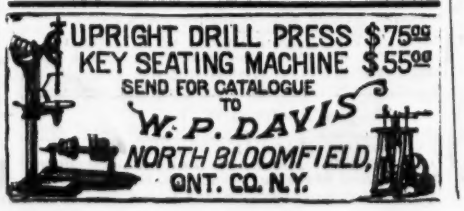
A. J. SMITH, Gen'l Pass. Ag't.



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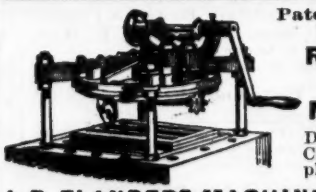

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New Descriptive Circular on application

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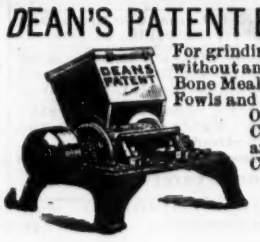

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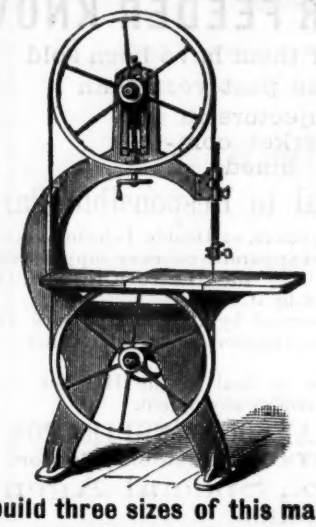

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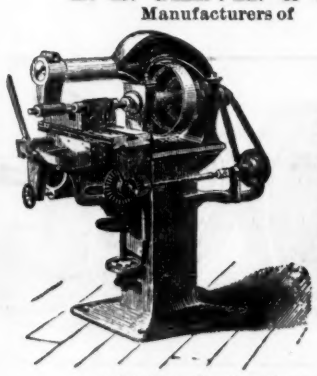

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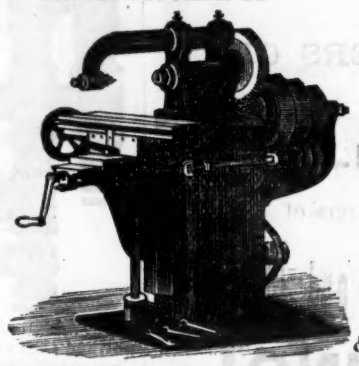

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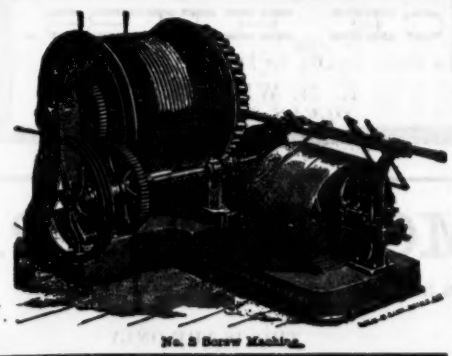

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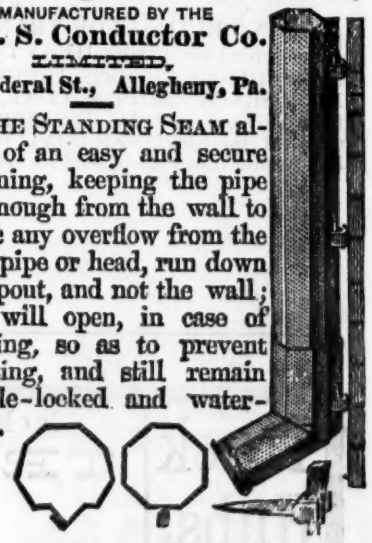

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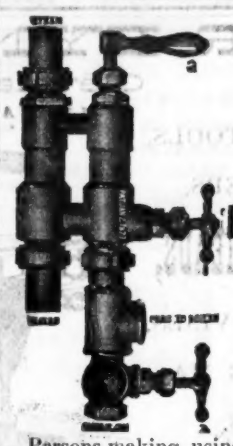

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On the 23d of June a suit in chancery was commenced by it against James Jenks, of Detroit, Mich., for making and selling the "Duplex Injector," so-called. Other infringers will be promptly sued.

The Inspirator Company will defend all who use or deal in the Hancock Inspirator against any suits which allege it to be an infringement of any patent.

THE HANCOCK INSPIRATOR CO.
H. M. WHITNEY, President, Boston, Mass.

Fairbanks, Morse & Co., Special Agents.
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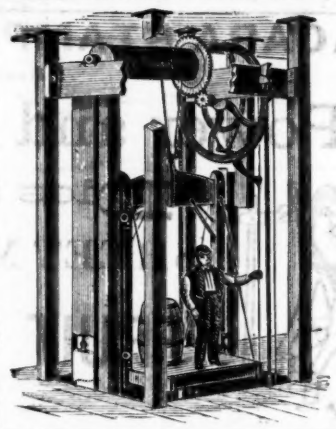

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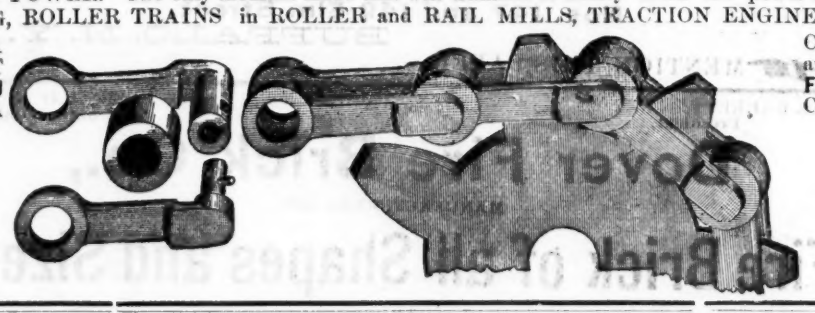

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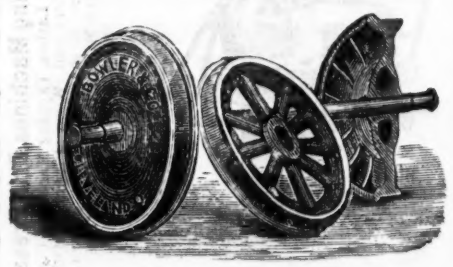

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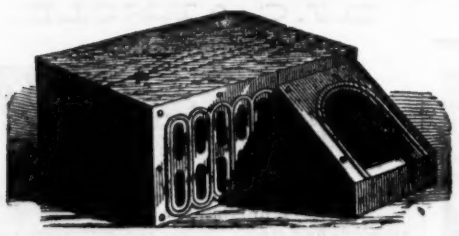

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And shuts the door by his own weight,
And then he jumps right through a hole
And thinks he's out; but bless his soul
He's in a cage, some how or other,
And sets the trap to catch another."

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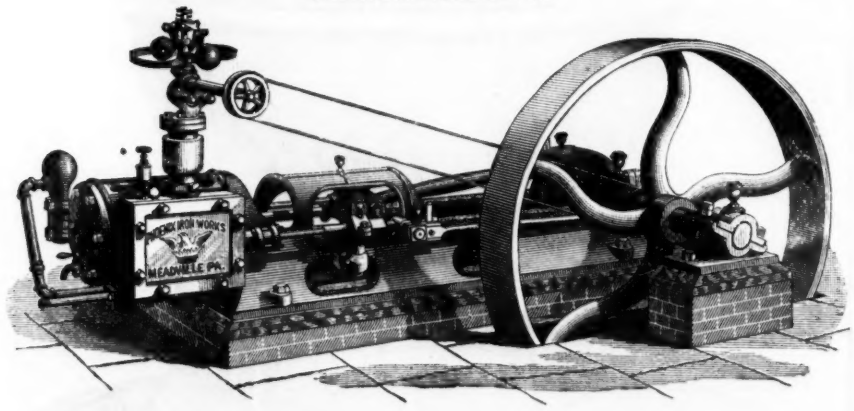

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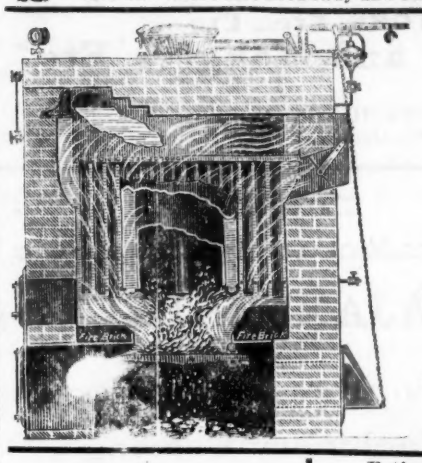

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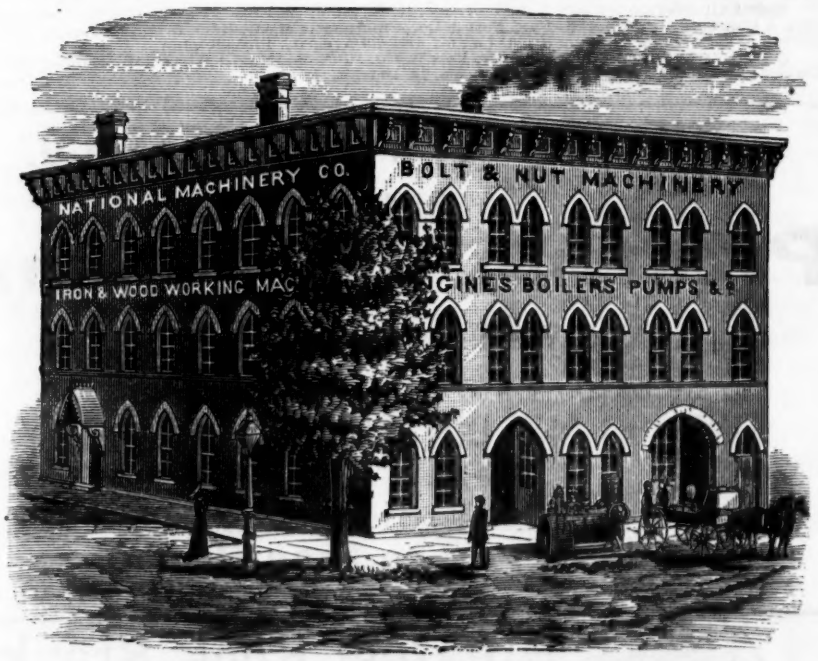

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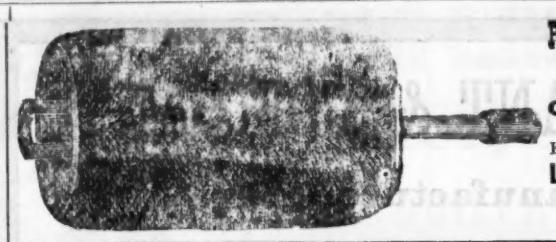

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